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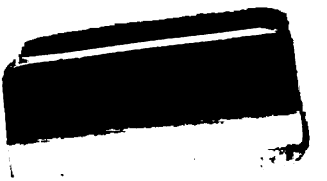

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64TH CONGRESS, 1ST SESSION. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 54.

L'ANGUILLE AND ST. FRANCIS RIVERS, ARK.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF L'ANGUILLE RIVER, ARK., WITH A VIEW TO ASCERTAINING WHETHER LOCKS AND DAMS SHOULD BE BUILT TO AFFORD SLACK-WATER NAVIGATION TO MADISON ON THE ST. FRANCIS RIVER.

DECEMBER 7, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 6, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated 4th instant, together with copy of a report from Maj. E. M. Markham, Corps of Engineers, dated August 13, 1915, on preliminary examination of L'Anguille and St. Francis Rivers, Ark., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 4, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of L'Anguille and St. Francis Rivers, Ark.

1. There is submitted herewith for transmission to Congress report dated August 13, 1915, by Maj. E. M. Markham, Corps of Engineers, on preliminary examination authorized by the river and harbor act approved March 4, 1915, of the L'Anguille River, with a

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view to ascertaining whether locks and dams should be built to afford slack-water navigation to Madison on the St. Francis River.

2. L'Anguille River is a tributary of the St. Francis River, emptying into the latter 48 miles below the town of Madison, on the St. Francis River. The examination therefore covers not only L'Anguille River, but a stretch of 48 miles on the St. Francis. Its scope is similar to that of an examination of the St. Francis and L'Anguille Rivers authorized by the act of July 25, 1912, report on which is printed in House Document No. 45, Sixty-third Congress, first session, and is unfavorable to the permanent improvement of these streams. The district officer states that there have been no changes in conditions which would suggest the advisability of a change in the conclusions previously expressed, and he reports that the commerce on the St. Francis and L'Anguille Rivers, present and prospective, does not warrant the improvement of said streams by locks and dams. The division engineer concurs in this opinion.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated September 14, 1915, concurring in the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of L'Anguille River, with a view to the construction of locks and dams to afford slack-water navigation to Madison on the St. Francis River, is not deemed advisable at the present time.

DAN C. KINGMAN,
Chief of Engineers, U. S. Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 14, 1915.

The CHIEF OF ENGINEERS UNITED STATES ARMY:

1. The following is in review of the district officer's report on preliminary examination of the L'Anguille River, with a view of ascertaining whether locks and dams should be built to afford slack-water navigation to Madison on the St. Francis River, called for by the act of March 4, 1915.

2. This investigation is in all essentials identical with the one reported upon in House Document No. 45, Sixty-third Congress, first session, authorized by the act of July 25, 1912. The questions there propounded were the feasibility and cost of providing permanent navigation. A study of physical conditions showed that permanent navigation could be secured only by the use of locks and dams. The report analyzed both physical and commercial conditions with considerable detail and the conclusion was reached that the United States would not be justified in entering upon this work. There has been no change of importance—physical or commercial—since 1912, and the district officer adheres to the

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opinion then expressed that the commerce on the St. Francis and L'Anguille Rivers, present and prospective, does not warrant the improvement of the said streams by locks and dams. In this view the division engineer concurs.

3. Interested parties were informed of the district officer's unfavorable report and given an opportunity of submitting statements and arguments to the board, but no communications on the subject have been received.

4. The principal point developed by the report of the district officer is the similarity of conditions now and in 1912, when, after very careful and detailed investigations, it was considered inadvisable to undertake the improvement of the St. Francis and L'Anguille Rivers by locks and dams. In view of the foregoing the board concurs with the district officer and the division engineer in adhering to that conclusion.

5. In compliance with law the board reports that there are no questions of terminal facilities, water power, or other related subjects which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

For the board.

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

PRELIMINARY EXAMINATION OF L'ANGUILLE AND ST. FRANCIS RIVERS, ARK.

UNITED STATES ENGINEER OFFICE,
Little Rock, Ark., August 13, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
(Through the Division Engineer.)
Subject: Preliminary examination of L'Anguille and St. Francis Rivers, Ark.

1. This report covers a preliminary examination of the L'Anguille River, with a view to ascertaining whether locks and dams should be built to afford slack-water navigation to Madison, on the St. Francis River, provided for by the river and harbor act of March 4, 1915.

2. Reports on prior examinations covering either the L'Anguille or the St. Francis River, or both, are given in the documents referred to in the following tabulation:

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mammelle Prairie to mouth	House	60	Forty-first	Third	1871	356
Mouth to Wittsburg and Marianna	do	125	Fifty-sixth	Second	1898	1678
Kennett to mouth	do	163	Fifty-ninth	First	.....	.....
Mouth of St. Francis to Marianna, on L'Anguille	do	1089	Sixty-second	Third	.....	.....
Mouth to Madison and Marianna	do	45	Sixty-third	First	.....	.....

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3. The L'Anguille River is a tributary of the St. Francis, emptying into the latter 48 miles below the town of Madison. Therefore, to consider improvement to Madison, the St. Francis River, from the mouth of the L'Anguille to that town, must be included in the consideration. This, then, reduces the present examination to identically that directed by the river and harbor act of July 25, 1912, viz, examination of St. Francis River, Ark., from its mouth to Madison and the L'Anguille River from its junction with St. Francis to Marianna, for the purpose of ascertaining the feasibility and cost of providing permanent navigation thereon. Report on the examination last referred to was submitted February 15, 1913, and published as House Document No. 45, Sixty-third Congress, first session.

4. Since the rendition of the said report there have been no changes in the physical conditions of either of the rivers involved, hence the present examination has been confined to an endeavor to determine the present and prospective commercial worth of these waterways. There appears to have been no change in the class of commerce, except a marked decrease in quantity is noted during the calendar year 1914. As to the character of the commerce and the navigation periods, the following is quoted from prior report:

The commerce of the streams is made up of agricultural products, forest products, and general merchandise. The greatest demand for the movement of the agricultural products, principally cotton and grain, is during the autumn and early winter (five months); that is, from the first of September, when the cotton movement begins, to the latter part of January, when the cotton and cottonseed are practically all moved out. As a rule these rivers are too low for navigation one-half of this time. The forest products—principally saw logs—are moved in rafts and on barges. The movement by barge is by the same class of craft as is employed on the Mississippi and Ohio Rivers, since practically all of the barged logs are consigned to Mississippi River points—Helena, Memphis, and Cairo. Under present conditions towboats and barges can not operate on the St. Francis River above Fords Bar in excess of about five and one-half months, namely, from the middle of January to the last of June. Below Fords Bar such boats and barges may operate for about eight months. The rafting period on the St. Francis above Fords Bar and on the L'Anguille to Marianna continues seven and one-half months, i. e., to about the middle of August, the limit varying somewhat each year. Practically all of the rafted logs go to Marianna. The need for the movement of the forest products continues, of course, throughout the year. For boats doing a general packet business, i. e., movement of general merchandise and package freights, the navigation period begins about the middle of December, terminates about the last of August (eight months) on the St. Francis above the mouth of Blackfish Bayou, and about the last of September (nine months) on the L'Anguille to Marianna. Below Fords Bar these boats can operate nearly all the year on St. Francis River, with the exception perhaps of three weeks in October or November.

A statement of the tonnage for the last three calendar years, with a comparison of the average of the said years and that of the prior five years, is shown in the following tabulation:

General classification.	Previous 5-year average, period 1907–1911.	Period 1912–1914.			
		1912	1913	1914	3-year average.
	Short tons.	*Short tons.*	*Short tons.*	*Short tons.*	*Short tons.*
Agricultural products	3,608	2,425	2,856	992	2,091
Groceries and merchandise	3,257	1,491	1,779	367	1,212
Lumber, piling, staves, etc	5,190	14,707	3,436	444	6,196
Barged saw logs	97,177	125,845	118,422	39,222	94,496
Rafted saw logs	53,194	56,231	64,247	64,495	61,651
Unclassified	361	2,400	440	37	959
Total	162,787	203,099	291,180	105,557	166,604

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There is appended hereto as Appendix A [1] a tabulation giving the details of the commerce of each of the three years, 1912 to 1914,

5. The St. Francis and L'Anguille Rivers have been under improvement for several years by snagging operations, which have served to render fully available to navigation the natural capacity of the stream.

6. Letters of inquiry were directed to interested parties, requesting such information as they deemed pertinent, tending to show present or prospective commercial worth such as to warrant the expenditure required for the construction of locks and dams to afford slack-water to Madison on the St. Francis and to Marianna, on the L'Anguille. The replies (but two) apparently indicate that the request for reexamination was based upon a hope that the desired improvement might be effected for about half of the estimate given in previous report, viz, $2,000,000. Appended hereto,[1] as Appendix B and Appendix C, are copies of letters received in reply to the inquiries made.

7. Much consideration and time were devoted to prior report on this subject and I find no occasion to suggest any change in the conclusions expressed therein, viz, that the commerce on the St. Francis and L'Anguille Rivers, present or prospective, does not warrant the improvement of the said streams by locks and dams.

8. The development and utilization of water power or kindred subjects are not involved in this examination. Improvement of terminal facilities on the streams in consideration is limited to one steamboat warehouse at Marianna, equipped with a hoisting engine and incline track, for transporting freight.

9. List [1] of names of persons, informed of this unfavorable report, accompanies.

E. M. MARKHAM,
Major, Corps of Engineers.

[First indorsement.]

OFFICE DIVISION ENGINEER, WESTERN DIVISION,
St. Louis, Mo., August 19, 1915.

The CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The opinion of the division engineer as expressed on the former report is reaffirmed, that the immediate and prospective benefits to navigation are not sufficiently important to justify the permanent improvement of these streams by locks and dams at an estimated cost of $2,000,000.

C. McD. TOWNSEND,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

[1] Not printed.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 55.

LITTLE RIVER AND TRIBUTARIES, BAYOUS CASTOR AND DUGDEMONA, LA.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF LITTLE RIVER AND TRIBUTARIES, BAYOUS CASTOR AND DUGDEMONA, FROM THE MOUTH OF LITTLE RIVER TO WINNFIELD, LA., ON BAYOU DUGDEMONA, AND TO OLLA, LA., ON BAYOU CASTOR.

DECEMBER 7, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 6, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated 4th instant, together with copy of a report from Maj. J. R. Slattery, Corps of Engineers, dated July 7, 1915, with map, on preliminary examination of Little River and tributaries, Bayous Castor and Dugdemona, La., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

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WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 4, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Little River and tributaries, Bayous Castor and Dugdemona, La.

1. There is submitted herewith, for transmission to Congress, report dated July 7, 1915, with map, by Maj. J. R. Slattery, Corps of Engineers, on preliminary examination called for by the following item contained in the river and harbor act approved March 4, 1915:

Little River and tributaries, Castor and Dugdemonia [Dugdemona], from the mouth of Little River to Winnfield, Louisiana, on the Dugdemonia, and to Olla, Louisiana, on the Castor.

2. Little River is formed by the union of Bayous Castor and Dugdemona. Both of these bayous are narrow, tortuous streams, obstructed by snags, trees, and fixed bridges, and have no commerce or navigation. Little River is navigable at high stages for boats drawing 3 feet, but at low water the channel is so seriously obstructed by snags, trees, etc., as to render navigation impossible. The district officer reports that the improvement of these streams would be expensive and that it is desired with a view to the drainage of low lands rather than for the benefit of navigation. He is of opinion, in which the division engineer concurs, that these streams are unworthy of improvement by the Federal Government.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated September 14, 1915, concurring in the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Little River and tributaries, Bayous Castor and Dugdemona, from the mouth of Little River to Winnfield, La., on Bayou Dugdemona, and to Olla, La., on Bayou Castor, is not deemed advisable at the present time.

DAN C. KINGMAN,
Chief of Engineers U. S. Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 14, 1915.

The CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's report on preliminary examination of Little River and tributaries, Castor and Dugdemona, from the mouth of Little River to Winnfield, La., on the Dugdemona, and to Olla, La., on the Castor, called for by the act of March 4, 1915.

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2. Little River is formed by the union of Bayous Castor and Dugdemona. It is about 115 miles in length and empties into Black River at Trinity, La. Both the bayous are narrow, tortuous streams, obstructed by snags, trees, and fixed bridges, and have no commerce or navigation. Little River is navigable for boats drawing 3 feet, at high stages during the winter and spring, but at low water the channel is so seriously obstructed by snags, trees, etc., as to render navigation impossible. Originally the river was used extensively for rafting timber, but except for a few small rafts and a limited amount of miscellaneous commerce, there is now no traffic.

3. It appears from the investigations of the district officer, that improvement would be very expensive, and, moreover, it is desired on account of the benefit expected in the drainage of low lands and not with a view to securing navigation or any expectation that a commerce would be created as a result of the improvement. In view of these conditions, the district officer is of the opinion, in which the division engineer concurs, that all three streams are unworthy of improvement by the Federal Government.

4. The usual notice of unfavorable report was sent out by the district officer, but no communications on the subject have been received by the board.

5. There is no navigation on Castor and Dugdemona Bayous and only a small amount at high stages on Little River. The improvement is apparently desired in the interests of drainage, and would not result in any material commercial benefit so far as navigation is concerned. The board therefore concurs with the district officer and the division engineer and reports that, in its opinion, it is not advisable for the United States to undertake the improvement of these streams.

6. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other related subjects having any material bearing upon the improvement of navigation at this locality.

For the board:

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

PRELIMINARY EXAMINATION OF LITTLE RIVER AND TRIBUTARIES, CASTOR AND DUGDEMONA, LA.

UNITED STATES ENGINEER OFFICE,
Vicksburg, Miss., July 7, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Report on preliminary examination of Little River and tributaries, Castor and Dugdemona.

1. The river and harbor act approved March 4, 1915, provided for the preliminary examination of Little River and tributaries, Castor and Dugdemona, from the mouth of Little River to Winnfield, La., on the Dugdemona, and to Olla, La., on the Castor. The duty of making this examination was assigned to the undersigned by department letter dated March 15, 1915, and report is submitted accordingly.

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2. Little River is formed by the union of Bayous Castor and Dugdemona near the northeast corner of Grant Parish, La. It flows in southerly direction for about 40 miles, thence in a southeasterly direction for about 40 miles more, and enters Lake Catahoula; it leaves the lake by two channels known, respectively, as French Fork and Old River, which unite about 8 miles from the lake, from which point the river flows in a northeasterly direction for 15 miles and empties into the Black River at Trinity, La. The most generally used outlet is the French Fork, which leaves the southern shore of the lake about 7 miles from the point where Little River enters it. The length of French Fork from the point where it leaves the lake to the point where it joins Old River is about 12 miles. The total length of the river from its source to its mouth is therefore about 115 miles. Except in the vicinity of Catahoula Lake the banks of the river are high. In the vicinity of the lake they are low and swampy. At high stages, which occur in the winter and spring, the river is readily navigable throughout its course for boats drawing 3 feet. At low stages, which occur during the summer and fall, the channel is so obstructed by sunken logs as to render through navigation impossible. Some local navigation, however, is possible. The width of the stream increases from about 200 feet at its source to about 600 feet at its mouth. The fluctuation between high and low stages is about 35 feet. The crops are moved in the fall and early winter. The river is spanned by bridges at Rochelle, Grant, and Archie. The first and last named are drawbridges with openings 60 feet and 114 feet wide in the clear, respectively. The bridge at Grant is a fixed bridge with a head clearance of 6½ feet at high water and a clearance between piers of 172 feet.

3. Dugdemona Bayou is a narrow, tortuous stream lying entirely within Winn Parish, La. It is really the main drain of a strip of low bottom land about 17 miles in length and from 1 to 2 miles wide, extending in a southeasterly direction from Winnfield, La., to Rochelle, La. In its upper reaches its banks are low and swampy. The banks become higher as the mouth is approached, where they are probably 15 feet high. The width of the stream varies from about 40 feet near the source to about 100 feet near the mouth. High-water stages occur during the winter and spring and are between 15 and 20 feet higher than low stages, which occur in the summer and fall. Extreme floods are reported to have gone considerable higher. The stream is spanned by fixed bridges near Winnfield, Curry, and the mouth. The bridge near Winnfield is a trestle bridge only a few feet above the water surface, with both spans approximately 15 feet apart. The bridge near Curry is a truss bridge with a clear span of approximately 75 feet. The bridge near the mouth was not examined. The channel is much obstructed by snags, overhanging trees, and great cypresses growing in the bed and by sharp bends.

4. Bayou Castor, like Bayou Dugdemona, is a narrow tortuous stream, forming the principal drain of a strip of low heavily timbered bottom land, about 12 miles long and from 1 to 2 miles wide, extending in a southwesterly direction from Olla, La., to Rochelle. Its banks are somewhat higher than the banks of the Dugdemona, and its width about the same. It is subject to the same fluctuations as the Dugdemona and at the same periods. Fixed highway bridges span

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the stream near Castor and at the mouth, affording clear openings estimated, respectively, to be 60 and 40 feet. Both bridges are but slightly above flood stage. The channel is obstructed in the same manner as the channel of the Dugdemona.

5. Previous examinations of these streams have been made as follows: Dugdemona Bayou in 1887; report printed on page 1489, Report of Chief of Engineers for 1887; unfavorable.

Bayou Castor in 1891; report printed on page 2028, Report of Chief of Engineers for 1891; unfavorable.

Little River in 1887, report printed on page 1498, Report of Chief of Engineers for 1887; unfavorable, except for the portion between mouth and Catahoula Lake, which was recommended to be cleared of snags, sunken logs, and leaning trees.

Little River in 1895, report printed on page 1984, Report of Chief of Engineers for 1895; unfavorable, except a portion below Catahoula Lake.

6. The bottom lands through which Dugdemona and Castor Bayous flow are very rich and would be very productive if protected from overflow. They are overflowed, however, practically every year and are not under cultivation. These overflows may result either from freshets brought down by the stream or from back water from the Red River, or from a combination of the two. Bordering the bottom lands are the hill lands, on which the soil is said to be poor. These hill lands were originally covered with valuable timber, and are still only partially cleared. Lumbering is the principal business in the territory as well as on the upper portion of Little River. Below Lake Catahoula, rich plantations, producing cotton and corn, border both banks of the river.

7. Originally considerable use was made of Little River for rafting out logs and staves, and some use was made occasionally of Dugdemona and Castor Bayous for the same purposes, but with the coming of the railroads, which closely parallel all these streams, practically all of this traffic has left the river and is now carried by rail. There is no commerce now on the Dugdemona and Castor and only an occasional raft and about 500 tons of cotton, 1,000 tons of cotton seed, and 250 tons of miscellaneous merchandise per year on the Little River. A number of lumber and sawmill men were interviewed as to the desirability of improving these streams in the interest of better transportation facilities for the handling of logs and lumber, and all agreed that neither lumber nor logs would be moved to any extent on the streams, even if improved. Mr. Henry E. Hardtner, to whom nearly every one interviewed referred to as the leader in the movement for the improvement of Dugdemona and Castor, frankly stated that it was not navigable channels or navigation that was wanted, but drainage, and that it was not expected that the United States would undertake this, but it was desired that the subject be investigated and a report made showing just what could be done in this line.

8. Dugdemona and Castor Bayous are not susceptible of sufficient improvement to render them capable of serving the purposes of transportation. Little River is more susceptible of improvement, and could be made a useful means of transportation if it were needed as such. There is, however, little demand for the improvement of any of these streams, and what little demand there is is based on the

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influence which their improvement might have on drainage and freight rates rather than on any desire or necessity of using them for actual transportation purposes; the commerce on them is nil, or negligible; and there is little prospect that there would be any material increase as the result of their improvement. All three streams are therefore believed to be unworthy of improvement by the Federal Government.

9. No plans for the development of water power nor for the drainage of adjacent territory could be coordinated with plans for the development of these streams in the interest of navigation.

10. There is submitted herewith a sketch map showing these rivers and the territory they drain.

J. R. SLATTERY,
Major, Corps of Engineers.

[First indorsement.]

OFFICE DIVISION ENGINEER, WESTERN DIVISION,
St. Louis, Mo., July 20, 1915.

The CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. Concurring in the views of the district officer that the streams are unworthy of improvement by the General Government.

C. McD. TOWNSEND,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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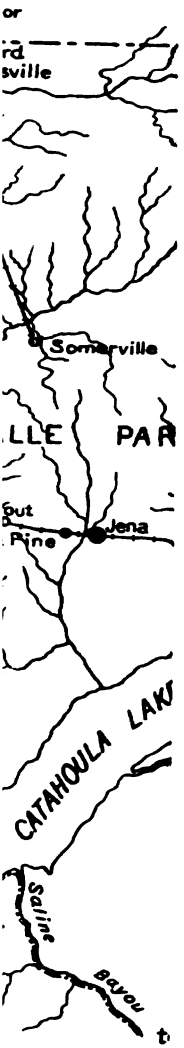

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 56.

MYSTIC RIVER, CONN.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF MYSTIC RIVER, CONN.

DECEMBER 7, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 6, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated 4th instant, together with copy of a report from Maj. G. B. Pillsbury, Corps of Engineers, dated July 30, 1915, with map, on preliminary examination of Mystic River, Conn., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 4, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Mystic River, Conn.

1. There is submitted herewith for transmission to Congress report dated July 30, 1915, with map, by Maj. G. B. Pillsbury, Corps of Engineers, on preliminary examination authorized by the river and harbor act approved March 4, 1915, of Mystic River, Conn.

2. The Mystic River is a tidal stream emptying into Fishers Island Sound about 5 miles to the east of New London, Conn. The existing project for its improvement provides for a channel 15 feet

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deep at mean low water and 100 feet wide, with increased width at the bends, from Fishers Island Sound to the highway bridge at Mystic; thence 12 feet deep and generally 100 feet wide to a point about 700 feet northerly from the wharf of the Mystic Manufacturing Co. This project is essentially completed, and the channels are in good condition. The further improvement now particularly desired, so far as could be determined, is the dredging of a straight channel to Mason Point to cut off the wide bend in the easterly entrance channel. Another suggested improvement is the straightening of the westerly entrance by cutting a channel to the west of the beacon at the entrance to the river, while a third improvement proposed is the deepening of the main channel in the river at the junction of the two entrance channels. These improvements would make the navigation of the entrance channels more convenient, but the district officer does not believe that the benefits to be derived in either case would be commensurate with the cost of the work. He therefore expresses the opinion, in which the division engineer concurs, that the further improvement of Mystic River is not advisable at the present time.

3. This report has been referred, as required by law, to the board of engineers for rivers and harbors, and attention is invited to its report herewith, dated September 15, 1915, concurring in the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the board of engineers for rivers and harbors, and therefore report that the improvement by the United States of Mystic River, Conn., is not deemed advisable to a greater extent than is authorized by the existing project.

DAN C. KINGMAN,
Chief of Engineers, U. S. Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 15, 1915.

THE CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's report on preliminary examination of Mystic River, Conn., called for by the act of March 4, 1915.

2. The Mystic River is a tidal stream entering Fishers Island Sound about 5 miles east of New London. The existing project provides for a channel 15 feet deep at mean low water and 100 feet wide from the sound to the highway bridge at Mystic, 3 miles; thence 12 feet deep and generally 100 feet wide to a point 700 feet northerly from the wharf of the Mystic Manufacturing Co., 0.8 mile. The project is practically completed and the channel is in good condition. The total amount expended on this and previous projects to June 30, 1914, was $48,203.91.

3. The commerce amounts approximately to 50,000 tons annually, the principal items being coal, stone, and lumber, and, so far as the records show, there has been no material change in recent years.

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4. The principal improvement desired is stated to be the dredging of a cut-off channel near the mouth of the river, whereby a bend will be eliminated, resulting in a shorter and, in thick weather, a more easily navigated channel approach to Mystic. The length of the cut would be about three-fourths of a mile and the channel distance would be shortened about 1 mile. The district officer states that, even if no rock were encountered, the first cost of such a channel would be considerable and maintenance operations would be necessary. There is nothing to show that the cost of the channel would be justified by the benefits to commerce. Two other improvements of minor importance were suggested to the district officer, but neither appeared worthy of serious consideration, as neither was of urgent need or offered expectations of returns commensurate with the cost. The district officer therefore reports that the further improvement of Mystic River, Conn., is not advisable at the present time. The division engineer concurs in this view.

5. Interested parties were informed of the unfavorable report of the district officer and given an opportunity of submitting their views on the subject, but no communications have been received by the board.

6. From the information now available, it appears that the Mystic River has very fair navigation facilities, that the commerce is quite stable in amount and character and would not be increased by the improvement now desired, that the improvement would be a convenience to only a part of the commerce rather than a necessity, and that its cost would be excessive when compared with resulting benefits.

7. The board therefore concurs with the district officer and the division engineer, and reports that, in its opinion, it is not advisable at this time to undertake any additional improvement of Mystic River, Conn.

8. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other related subjects which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

For the board.

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

PRELIMINARY EXAMINATION OF MYSTIC RIVER, CONN.

UNITED STATES ENGINEER OFFICE,
New London, Conn., July 30, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Preliminary examination of Mystic River, Conn.

1. The following report on the preliminary examination of Mystic River, Conn., is submitted in compliance with the provisions of the river and harbor act of March 4, 1915.

2. The Mystic River is a tidal stream in the eastern part of the State of Connecticut. It enters Fishers Island Sound about 5 miles to the east of New London, and extends in a general northeasterly

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direction past the villages of Noank, West Mystic and Mystic to Old Mystic, a distance of about 6 miles. At Old Mystic it receives the discharge of several small and unimportant fresh-water streams. In the lower part of its tidal course, the river has a comparatively deep and narrow channel, which passes between broad areas of shoal water, but near the head of the tidal portion the channel becomes inconsiderable. Before its improvement was undertaken there was a depth of at least 15 feet at mean low water in the channel as far as the highway bridge at Mystic, 3 miles above the mouth, except on a shoal about one-half mile below this bridge, where the depth was but about 10½ feet. Above the highway bridge the channel had a natural ruling depth of 10 feet at mean low water for a distance of about a mile, thence about 6 feet to the old halfway dock, about one-quarter of a mile farther. The channel was quite narrow at some points and there were several bends in the course that made it rather difficult of navigation. Two channels connect the mouth of the river with deep water in Fishers Island Sound; the easterly, with a ruling depth of about 20 feet at mean low water, swings to the northeast and east around Ram Island; the westerly, with a ruling depth of about 12 feet at mean low water, runs to the west of Ram Island and gives more direct access to the sound. The mean tidal range is approximately 2.5 feet.

3. The river is crossed by two bridges; one, the highway bridge at Mystic, and the other, the New York, New Haven & Hartford Railroad bridge about one-half mile downstream from the first. Both are provided with swing draws. At the highway bridge the draw affords two navigable openings, each about 45 feet in width; at the railroad bridge a navigable channel is provided at but one opening, the width of which is 75 feet.

4. The improvement of the river was begun under the river and harbor act of September 19, 1890, in accordance with a plan contained in a report printed in the Annual Report of the Chief of Engineers for 1889, page 746. The project provided for the easing of 5 bends in the channel, and dredging to secure a channel 100 feet wide and 15 feet deep at mean low water to the highway bridge at Mystic. The estimated cost of the work was $30.000. In the progress of the work of cutting back the bend at the entrance to the river, ledge rock was encountered, on account of which the estimated cost of the work was increased to a total of $36,600 (annual report for 1898, p. 88). The improvement, including the removal of the rock to a depth of 16 feet below mean low water, was completed in 1900 at the total cost estimated.

5. A second examination and survey of the river was authorized by the river and harbor act of March 3, 1909, the report upon which (H. Doc. No. 858, 61st Cong., 2d sess.) recommended that the channel previously secured, which had shoaled somewhat since its completion, be restored and maintained, at an estimated first cost of $3,500, with $1,000 every three or four years for maintenance. This project was adopted by the river and harbor act of July 25, 1912; and the restoration of the channel was accomplished in 1913. A further examination and survey, directed to the portion of the river above the highway bridge, was authorized by the river and harbor act of February 27, 1911, the report upon which (H. Doc. No. 637, 62d Cong., 2d sess.) recommended a channel of a general width of 100 feet

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and depth of 12 feet at mean low water from the highway bridge to a point about 700 feet northerly from the wharf of the Mystic Manufacturing Co. (a distance of about 0.85 mile) at an estimated cost of $8,160, with $1,000 once in 10 years for maintenance. This addition was adopted by the river and harbor act of March 4, 1913, and was essentially completed during the same year with the funds appropriated. The project now existing for the improvement of Mystic River provides, therefore, for a channel 15 feet deep at mean low water and 100 feet wide, with increased width at the bends, from Fishers Island Sound to the highway bridge at Mystic; thence 12 feet deep and generally 100 feet wide to a point about 700 feet northerly from the wharf of the Mystic Manufacturing Co. This project is essentially completed, and the channels at the present time are in good condition. The maximum draft that can be carried at mean low water through the improved portion of the river, due allowance being made for the necessary margin between channel depth and vessel draft, is about 14 feet to the highway bridge, thence 11 feet to the head of the dredged channel.

6. There is a town wharf at Noank, which is maintained in good condition by the town authorities, and whose use is free to the public. It has no unloading facilities. At Noank and Mystic there are a number of private wharves, several of which were reported by their owners as being open to all on equal terms at reasonable wharfage rates. The terminal facilities of the waterway appear to be sufficient for the needs of present and prospective commerce.

7. The present commerce of the waterway amounts to approximately 50,000 short tons per annum. The principal items are coal (about 22,000 tons), riprap stone from a quarry situated between Noank and Mystic (21,000 to 26,000 tons), and lumber, which has varied in the last three years between about 2,000 and 7,000 tons, depending upon the activity of a shipyard near Noank. Considerable amounts of fish and lobsters are brought into Noank by fishermen. The reported value of the commerce during the past calendar year, exclusive of the fish and lobsters, was $130,929.60. The commerce appears to be about stationary. The statistics for the calendar year 1908, collected in connection with the report on the survey in which the restoration of the channel was recommended, showed a total tonnage of 67,127 tons, valued at $446,410, including fish to the amount of 456 tons, valued at $76,640. The last prior report, for the calendar year 1899, showed a tonnage of 53,041 short tons, exclusive of the tonnage of ships launched. On the exhaustion of the quarry from which the stone is obtained a considerable decrease in the commerce of the waterway is to be anticipated. In addition to its use for the delivery and shipment of the commerce presented, the Mystic River is the home port of a number of large seining steamers employed at a neighboring menhaden reduction plant, and other vessels are occasionally laid up at its wharves.

8. The further improvement of Mystic River now desired by interested parties, so far as could be determined at a duly advertised public hearing held at the United States engineer office in New London on July 21, 1915 (the record [1] of which is appended), or by other inquiry, is the dredging of a straight channel to cut off

[1] Not printed.

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the wide bend described by the river channel in conjunction with the easterly entrance channel. Vessels entering or leaving the harbor by way of the deeper easterly entrance turn through nearly a semicircle. It was represented that the distance saved by such a channel would be very material and that the straight channel could be much more easily navigated in thick weather. Other than these general statements, no data was presented at the hearing to show that the cost of the channel would be justified by its benefits to commerce.

9. It is unquestionable that a straight channel in the location desired, if cut to a sufficient cross section, would be a convenience to the navigation of the Mystic River. I know, however, of no benefit to commerce to be secured by such an improvement that would justify the cost of its execution and maintenance. The length of the cut would be about three-quarters of a mile through a shoal over which the depth, as shown on the charts, is but 7 feet at mean low water for a large part of the distance. Unless the channel were given ample dimensions, I anticipate that the more important vessels would continue to use the comparatively broad and deep natural channel rather than attempt the passage of a narrow dredged cut. Even if no rock were encountered in the dredging (a feature that can not be foretold without extensive borings), the first cost of the channel would be considerable, and maintenance operations would certainly be necessary from time to time. The distance saved to vessels entering and leaving by the deeper east channel would be very nearly 1 mile, while vessels entering or leaving by the west channel would not be affected by the improvement. If as high a transportation rate as 1 cent a ton-mile be assumed for the local delivery of water-borne freight—a very high figure—and if all receipts and shipments went through the east channel, the total annual financial saving in the carriage of freight through the reduction in distance would be but $500. In point of fact, a very considerable part of the commerce goes through the west channel, and the actual saving would be much less. In a fog the navigation of a straight channel would certainly be easier than the navigation of the curving natural channel, but the proposed cut-off would eliminate but a part of the difficulties of navigation in thick weather. Pilots intimately acquainted with the locality now take their vessels in and out in thick weather. Others would not attempt it, even if a portion of the channel were straightened.

10. As the improvement proposed does not appear to be called for on its general merits, it is unnecessary to consider the effect that the opening of a new channel might have on the existing natural channel at Noank. The matter is one that merits careful study, however, before a new channel is opened.

11. The improvement that has been outlined appears to be the one that was in view when the examination of the locality was authorized by Congress. At the hearing on the subject, a second item of improvement was suggested; the straightening of the west entrance by cutting a channel to the west of the beacon at the entrance to the river. Such an improvement would undoubtedly make the navigation of the western entrance more convenient, in the same manner that the improvement heretofore considered would make the navigation of the eastern entrance more convenient. It would be far less

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expensive than the improvement of the eastern entrance in the manner desired, unless it should be found that the excavation of large amounts of ledge rock was necessary for its accomplishment. I know, however, of no benefits that would justify its cost. Opening such a channel might injuriously affect the east channel in the vicinity and the approach to Noank, and might be considered inadvisable even were the expected benefits considerable.

12. A third form of improvement whose desirability was suggested some two years ago is the deepening of the main channel in the river at its junction with the two entrance channels. As has been stated, the easterly entrance has a clear depth of 20 feet at mean low water, and the channel along the Noank water front has even greater depth. At the junction of these two channels there is a small shoal on which the depth is limited to the project depth provided, 15 feet at mean low water. Noank is the site of the last of the several shipyards that in former years were one of the principal activities of the river. When this yard is engaged in construction, it receives considerable amounts of timber, and the schooners carrying this commodity need considerably more depth than the existing project affords. The yard is not now engaged in construction, however, and there is no desire manifest at the present time for an extension in the depth of the existing project.

13. For the reasons stated, I am of the opinion, therefore, that the further improvement of the Mystic River, Conn., is not advisable at the present time, and I recommend that a survey of the locality be not undertaken.

14. The navigable portion of the Mystic River being entirely tidal, no question of water power is related to its improvement.

G. B. PILLSBURY,
Major, Corps of Engineers.

[First indorsement.]

DIVISION ENGINEER, NORTHEAST DIVISION,
New York City, August 6, 1915.

The CHIEF OF ENGINEERS, UNITED STATES ARMY:

Forwarded, concurring in the views and recommendation of the district engineer office.

FREDERIC V. ABBOT,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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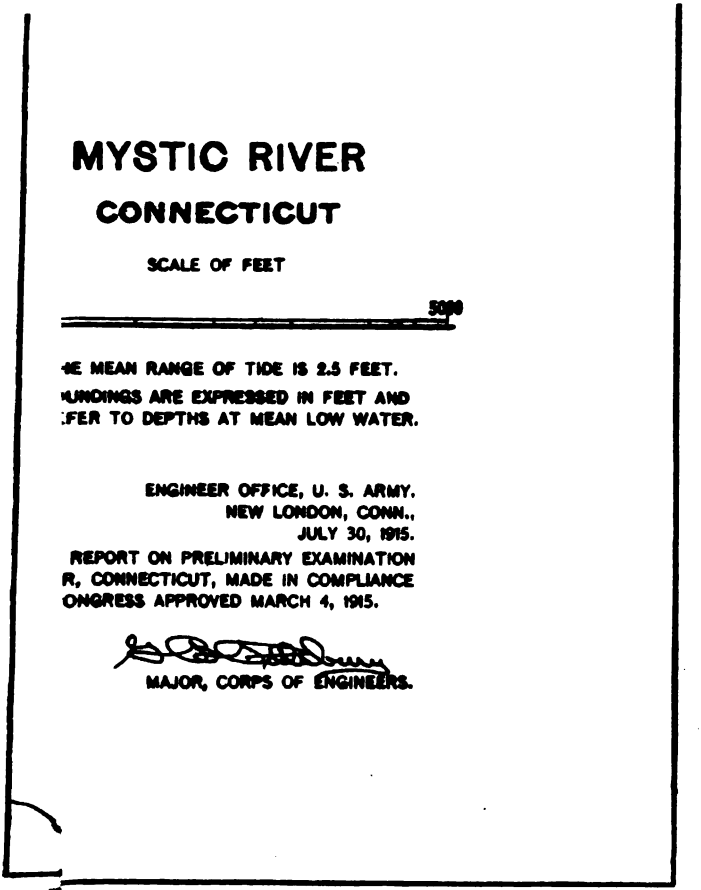
MYSTIC RIVER
CONNECTICUT
SCALE OF FEET
5000
HE MEAN RANGE OF TIDE IS 2.5 FEET.
UNDINGS ARE EXPRESSED IN FEET AND
FER TO DEPTHS AT MEAN LOW WATER.
ENGINEER OFFICE, U. S. ARMY.
NEW LONDON, CONN.,
JULY 30, 1915.
REPORT ON PRELIMINARY EXAMINATION
R, CONNECTICUT, MADE IN COMPLIANCE
ONGRESS APPROVED MARCH 4, 1915.
MAJOR, CORPS OF ENGINEERS.

House Doc. No. 56 ; 64th Cong., 1st Sess.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 57.

ROCKHALL HARBOR, MD.

LETTER

FROM

THE SECRETARY OF WAR.

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON REEXAMINATION OF ROCKHALL HARBOR, MD.

DECEMBER 7, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 6, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated 4th instant, together with copies of reports from Col. Lansing H. Beach, Corps of Engineers, and the Board of Engineers for Rivers and Harbors, dated July 20 and July 27, 1915, upon reexamination of Rockhall Harbor, Md., made in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 4, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Reexamination of Rockhall Harbor, Md.

1. Under authority contained in section 14 of the river and harbor act approved March 4, 1915, there are submitted herewith for transmission to Congress report dated July 20, 1915, by Col. Lansing H. Beach, Corps of Engineers, and report dated July 27, 1915, by the

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Board of Engineers for Rivers and Harbors, relative to the project for improvement of Rockhall Harbor, Md.

2. The project for improvement of this harbor which was adopted by the river and harbor act approved June 13, 1902, provided for dredging a channel 150 feet wide and 12 feet deep at mean low water from Chesapeake Bay to Swan Creek Inlet, across Swan Point Bar, and a channel of the same dimensions from Swan Creek Inlet to the wharf at Rockhall. The latter channel was completed in 1908. Owing to the fact that the Baltimore steamers no longer used this wharf, a recommendation was submitted in the Annual Report of the Chief of Engineers for 1912 that this part of the improvement be omitted from the project; it was also recommended that the project depth of the outer bar channel be reduced from 12 to 10 feet. A 10-foot channel across the bar was completed in August, 1914.

3. The district officer now states that the outer bar channel saves a distance for small boats of from 2 to 4 miles, depending upon destination. Its depth, however, is greater than is necessary for craft of this kind, and as steamers do not use the channel, it has become merely a convenience for small boats. He believes that, under these conditions, its maintenance by the United States is not justified, and he recommends that the project be abandoned. The division engineer and the Board of Engineers for Rivers and Harbors concur in these views and recommendations.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore recommend that legislation be enacted authorizing the abandonment of the project for improvement of Rockhall Harbor, Md.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
July 27, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. This report on Rockhall Harbor, Md., is submitted under authority of that portion of section 14 of the act of March 4, 1915, which reads, "and the Chief of Engineers is directed to make a report upon any other projects, river or harbor, the further improvement of which under present conditions is undesirable, or in which modifications of the plans or projects should be made."

2. The existing project, which was completed in 1914, provides for a channel 10 feet deep and 150 feet wide from the 10-foot contour in Chesapeake Bay, across Swan Point Bar, to the 10-foot contour in Swan Creek Inlet. The estimated cost of maintenance is about $3,500 a year.

3. The object of this channel is to afford a shorter and more convenient route for vessels plying between Baltimore and Rockhall than by the natural deep water around the lower end of Swan Point Shoal.

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Experience has shown that the steamers do not use the project channel and that the small vessels that do use it do not require a channel of the dimensions given. The improvement is a convenience rather than a necessity, and the district officer states that it adds nothing to the commerce of the locality. He therefore recommends that the project be abandoned, and the division engineer concurs.

4. It appears from the information now available that funds expended for the maintenance of the project do not bring commensurate returns. The channel affords a shorter and more convenient route for some vessels, but the benefits to commerce are not commensurate with the expenditures required for maintenance. In view of these conditions, the board concurs with the district officer and the division engineer, and recommends legislation authorizing the abandonment of the project.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

REEXAMINATION OF ROCKHALL HARBOR, MD.

UNITED STATES ENGINEER OFFICE,
Baltimore, Md., July 20, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Improvement of Rockhall Harbor. Md.

1. In compliance with directions of April 30, 1915, I have to submit the following report concerning the advisability of modifying or abandoning the present project for Rockhall Harbor, Md.

2. Rockhall Harbor is a small bight on the eastern shore of Chesapeake Bay, in Kent County, Md., nearly opposite the mouth of the Patapsco River and about 22 miles from Baltimore. It is on the easterly side of the water ordinarily known as Swan Creek Inlet, which is the name given to the channel running northward between Swan Point Spit and the mainland. A natural depth of 8 feet exists from Chesapeake Bay to the wharf at Gratitude, or, as it is also sometimes called, Rockhall Landing, at the mouth of Swan Creek. This wharf at Gratitude is about a mile and a half from the town of Rockhall.

3. The project for Rockhall Harbor originally consisted of two parts, one for a channel across Swan Point Spit or Bar from Chesapeake Bay to Swan Creek Inlet, the other from Swan Creek Inlet to the water front at Rockhall. The latter channel, about 5,700 feet in length, was abandoned in April, 1912, in accordance with report from the district officer of January 25, 1912, making recommendation to that effect. Copy of his letter is appended hereto, as it gives the history of the improvement, which is, therefore, not repeated in this report. The project since that date has been to dredge a channel 10 feet deep and 150 feet wide from the 10-foot contour in Chesapeake Bay across Swan Point Bar to the 10-foot contour in Swan Creek Inlet (river and harbor act of Mar. 4, 1913, H. Doc. No. 99, 56th Cong.,

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1st sess., no maps, and Annual Report of Chief of Engineers for 1900, pp. 1660–1672).

4. The project for the channel across the bar was completed in August, 1914. The channel is not used by steamboats, but is extensively used by small craft and by sailing vessels when the wind is favorable. The channel has not been marked by the Government, but has been very completely marked by private parties for their own benefit.

5. An examination made recently indicates that the rate of deterioration is about 3 per cent per year, and this rate will probably be continued unless steamers should attempt to use the channel. When side-wheeled steamers used the former channel, 80 feet in width, the rate of deterioration was about 30 per cent per year.

6. The present dredged channel across the bar saves a distance for small boats of from 2 to 4 miles, depending upon destination. Its depth, however, is excessive for the use of craft of this kind, and it adds nothing to the commerce of the locality. Steamers do not use it, and it has thus become merely a convenience for small boats.

7. It is not believed that it is worth while to spend money in maintaining the channel under these conditions, and it is recommended that the project be abandoned.

LANSING H. BEACH,
Colonel, Corps of Engineers.

[First indorsement.]

OFFICE OF DIVISION ENGINEER, EASTERN DIVISION,
New York City, July 21, 1915.

The CHIEF OF ENGINEERS:

Concurring in the views and recommendation of the district engineer officer.

W. M. BLACK,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

PRIOR REPORT RELATIVE TO MODIFICATION OF ROCKHALL HARBOR PROJECT.

UNITED STATES ENGINEER OFFICE,
Baltimore, Md., January 25, 1912.

SIR: 1. Referring to the present project for the improvement of Rockhall Harbor and inner harbor at Rockhall, I have the honor to submit the following report:

2. Rockhall Harbor is a small bight in the eastern shore of Chesapeake Bay in Kent County, Md., about 22 miles from Baltimore. The prevailing depth in the inner harbor before the improvement was begun was 5 feet at mean low water. The tide range is 1.1 feet. Swan Point Bar, extending south-southwesterly from Swan Point and forming a divide between Rockhall Harbor and deep water in Chesapeake Bay, is about 3¾ miles long and 1¼ miles from the Kent County shore. Rockhall is a settlement with a population of about 2,500 inhabitants, who are engaged principally in the fish and oyster industry.

3. This harbor first received the consideration of the Federal Government in 1890, when the river and harbor act of September 19 of that year provided for a preliminary examination. A report on this, recommending a survey of the harbor and across Swan Point Bar, was submitted by William F. Smith, United States agent, under date of November 20, 1890. The report on the survey was made under date of September 26, 1891, and an estimate of $9,513 was made for a channel 10 feet deep, 100 feet wide, and 5,650 feet long from the channel in

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Swan Creek Inlet to the old pier in the harbor, and another of $16,000 for a channel of the same width and depth and about 1 mile long across the Swan Point Bar, and stated that a distance of nearly 9 miles would be saved between Baltimore and this portion of the Kent County shore. A recommendation was made at this time only for the improvement of the channel in the inner harbor at a cost of $9,500.

4. The commercial statistics at the time of the preliminary examination were given as follows:

20,000 bushels of wheat	$18,000
25,000 bushels of corn	12,500
100,000 baskets of peaches	50,000
5,000 baskets of apples	2,500
3,000 baskets of pears	1,600
50 head of cattle	1,500
300 calves	2,400
1,500 lambs	6,000
6,000 pounds wool	1,500
Butter and eggs	4,000
Poultry	3,000
Potatoes	250
	103,250

The river and harbor act of August 17, 1894, provided for a survey of Rockhall Harbor, Md. As a result of an examination made under this act revised estimates were submitted for channels in the inner harbor and across the bar as follows:

For the inner harbor 100 feet wide and 10 feet deep, $7,134; and across the bar 10 feet deep and 80 feet wide, $9,600. No noticeable change in the hydrography of the harbor and adjacent waters had taken place since the survey of 1891. Between 1891 and 1894 those wishing the improvement changed their opinion as to the relative desirability of the two parts of the project and considered the cut across the bar as the more desirable. The result of this examination was a recommendation for a channel across the bar at an expenditure of $9,600, leaving the improvement of the inner harbor to be done by interested parties. It was said that the value of the commerce for 1894 was over $125,000.

5. The river and harbor act of June 3, 1896, appropriated $9,600 for completing the improvement in accordance with the recommendation for the channel across the bar and also $7,000 for improving the inner harbor. The commerce amounted to $379,500.

6. This project was completed June 14, 1898, and resulted in a continuous 10-foot mean low-water nativation from Rockhall to Chesapeake Bay. No commercial statistics could be obtained for 1898. In the report of the Chief of Engineers for 1899, it is stated that the maximum draft that could be carrier over the bar on June 30, 1899, is 8 feet and in the inner harbor 10 feet.

7. The river and harbor act of March 3, 1899, provided for an examination and survey of Rockhall Harbor, with a view to obtaining channels 12 feet deep and 150 feet wide both across the bar and in the inner harbor; also for a channel 190 feet wide and 12 feet deep across the bar. An examination made in accordance with this law showed the rate of shoaling to be 4.6 per cent per annum in the inner harbor and 30 per cent across the bar.

Estimates were submitted as follows:

For a depth of 12 feet and a width of 150 feet in the inner harbor	$19,140
For the same depth and width across the bar	23,925
For the same depth and 190 feet wide across the bar	31,515
Every two years for maintenance	9,208

The commerce was given as follows:

Agricultural products	95,000
Oysters, fish, and crabs	96,500
General merchandise	130,000
Lumber	15,000
Bricks	750
Fertilizers	12,600
Coal	10,000
	359,850

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No commercial statistics could be obtained for 1901 or 1902.

8. The project for channels 150 feet wide and 12 feet deep at mean low water was adopted at an estimated cost of $43,065 and an allotment of $12,000 was made from an appropriation in the river and harbor act of June 13, 1902. The commerce for 1902 is given as $330,425. The commercial statistics for 1903 are given as $324,795.

9. The contract for the expenditure of the $12,000 allotment of 1902 was completed June 1, 1904, the funds having been used in establishing a 10-foot navigation in the inner harbor. The maximum draft that could be carried over the bar at this time was 4 feet. No commercial statistics could be obtained for 1904. An allotment of $12,829.35 was made from the river and harbor act of March 3, 1905, for this project. This was expended in the inner harbor, which was completed to project dimensions, excepting for about 500 feet, which was of a lesser width. Commercial statistics for 1905 could not be obtained. Partial commercial statistics for 1906 amounted to $388,811. No statistics could be obtained for 1907 or 1908.

10. An allotment of $14,383.97 was made from an appropriation in the river and harbor act of March 2, 1907, and was expended in completing the channel in the inner harbor and dredging a channel 8 feet deep, 70 feet wide, and 2,240 feet long across Swan Point bar. On June 30, 1909, the maximum draft that could be carried across the bar was 5 feet. The unit price of dredging having exceeded that assumed in the original estimate, the estimated cost of the project was increased May 13, 1907, to $60,386.81. Commercial statistics for 1909 were 19,827 short tons, consisting of lumber, coal, agricultural products, canned goods, poultry, live stock, fish, oysters, and general merchandise, valued at $1,678,870. The number of vessels trading in Rock Hall Harbor was 2 steamers of an aggregate tonnage of 850 and a loaded draft of 7 feet and 65 sailing vessels and barges of an aggregate tonnage of 1,430 and a maximum draft of 9 feet.

11. An allotment of $21,711.08 was made from an appropriation in the river and harbor act of June 25, 1910, and one of $3,947.37 from the act of February 27, 1911. These sums have been expended in dredging in the channel across the bar, the work having been completed as far as funds would allow on December 20, 1911. Commercial statistics for 1910 were requested through the usual source of such information, but were not received. The same was true for 1911. The maximum draft that can now be carried over the bar is about 7.5 feet and in the inner harbor it is about 11.5 feet. A comparison of Coast Survey Charts for 1859 and 1905 shows some modification of the Swan Point shore line; this has been more pronounced since the beginning of dredging on the bar, the spit from Swan Point extending easterly and northerly toward Little Neck Island. There has apparently been no shifting of the 12-foot contour, but the bar above this depth seems to have broadened out in the direction of the channel axis.

12. To complete the project channel across the bar it is still necessary to dredge a distance of 1,600 feet for the full width of 150 feet and 4,620 feet for a width of 60 feet. This will require the removal of 90,000 cubic yards of material, scow measure. This, at 20 cents per cubic yard, plus about 10 per cent for engineering and contingencies, amounts to $19,613.19. During a period of the dredging operations from October 21 to December 20, 1911, a daily record was kept of the vessels passing through the channel across the bar. This shows it to have been used 4,492 times during this period, the vessels ranging in draft from 2 to 6 feet.

13. Before the shoaling of the 10-foot channel of the original project the steamboats to Rock Hall made daily trips through it, and would do so now were the depth sufficient. These boats carry considerable commerce from Baltimore to Rock Hall and vice versa. As they do not use the channel in the inner harbor, because of inability to obtain proper wharf facilities, and can not use the channel across the bar, the commerce can not be obtained as statistics for this improvement. Appropriations for this work to date are as follows:

For original project	$16,600.00
For existing project	60,386.81
For maintenance, existing project	4,484.91
Total	81,471.72

14. From the above history of the project it appears that the full estimated cost has been expended and that if the present project is to be completed the estimate therefor must be increased by $19,613.19, or to $80,000.

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15. In view of the lack of use of the dredged inner harbor channel, it is recommended that this part of the project be dropped and no longer be considered as a part thereof. The channel across the bar does not give much if any promise of stability and the cost of maintenance will be large. The present inadequate estimate for this purpose is $9,208 every two years. The entrance from the south to this harbor carries not less than 12 feet with ample width.

16. While the commerce is not large, the channel would, if completed, be a great convenience to large numbers of fishing, oyster, and other local boats, and to the daily Baltimore boats, saving about 7 to 9 miles in distance. The latter are practically the only ones requiring over 10 feet, except possibly an occasional schooner. All of these could use the entrance from the south. Grave doubts may therefore be expressed as to the advisability of continuing the efforts to maintain the channel across the bar, but considering the fact that the present project has never been completed and the lack of reliable commercial statistics upon which to base a recommendation, I have decided to request, under paragraph 212, Digest of Orders and Circulars, authority to increase the estimated cost of completion of the existing project for this place in the next annual report from $60,386.81 to $80,000 and to drop the portion thereof relating to the inner harbor. The total amount needed, $19,613.19, for completion should be appropriated in one sum, and unless this appropriation is obtained this Congress, not less than $10,000 should be added thereto for "maintenance," for restoring that portion of the channel already dredged. Meanwhile efforts will be made to obtain full commercial statistics and data upon which to predicate a more reliable estimate of maintenance.

Very respectfully,

W. C. LANGFITT,
Lieut. Col., Corps of Engineers.

THE CHIEF OF ENGINEERS, UNITED STATES ARMY.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 58.

ST. FRANCIS RIVER FROM MADISON TO ST. FRANCIS, ARK.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF THE ST. FRANCIS RIVER, FROM MADISON, ST. FRANCIS COUNTY, TO ST. FRANCIS, IN CLAY COUNTY, ARK.

DECEMBER 7, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 7, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit, herewith, a letter from the Chief of Engineers, United States Army, dated 4th instant, together with copy of a report from Maj. E. M. Markham, Corps of Engineers, dated August 10, 1915, with map, on preliminary examination of St. Francis River from Madison to St. Francis, Ark., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

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WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 4, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of St. Francis River from Madison to St. Francis, Ark.

1. There is submitted herewith for transmission to Congress report dated August 10, 1915, with map, by Maj. E. M. Markham, Corps of Engineers, on preliminary examination authorized by the river and harbor act approved March 4, 1915, of the St. Francis River, from Madison, St. Francis County, to St. Francis, in Clay County, Ark.

2. The St. Francis River is a tributary of the Mississippi, which it enters 8 miles above Helena, Ark. Madison and St. Francis are, respectively, 60 and 255 miles above the mouth, making the section covered by this examination 195 miles in length. The existing project for improvement of the river provides for the removal of logs, drifts, and snags from the channel, and overhanging timber from the banks from the mouth to Kennett, Mo. (25 miles below St. Francis), and closing the chutes and sloughs in the Sunken Lands. For a number of years operations have been limited to the section below Marked Tree, which is 83 miles below Kennett. No project is now in force for improvement above Kennett, although work on this part of the river has been done in the past. The commerce on this section consists mainly of the movement of saw logs and rough cooperage material to mills at St. Francis, with occasional shipments of plantation products. This section affords a practicable low-water channel for boats drawing 2 feet, except where it is obstructed by drift rafts. In the Sunken Lands below Kennett the channels are poorly defined and obstructed by dense growths of rank water grass. Through commerce would be practicable only at high stages, and then with difficulty. It appears that the opening of the river through this section is desired for drainage purposes as well as for navigation. Considering only the viewpoint of navigation, the district officer is of opinion that the present project for improving the St. Francis River is amply comprehensive for all navigation needs, present or prospective. In this view the division engineer concurs.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated September 28, 1915, concurring in the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of the St. Francis River, from Madison, St. Francis County, to St. Francis, in Clay County, Ark., is not deemed advisable to a greater extent than is contemplated by the existing project. In this connection attention is invited to my report of this date recommending a modification of the existing project, printed in House Document No. 60, Sixty-fourth Congress, first session.

DAN C. KINGMAN,
Chief of Engineers United States Army.

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REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 28, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's report on preliminary examination of the St. Francis River, from Madison, St. Francis County, to St. Francis, in Clay County, Ark., called for by the act of March 4, 1915.

2. The St. Francis River is a tributary of the Mississippi River, which it enters 8 miles above Helena, Ark. Madison is 60 and St. Francis 255 miles above the mouth, making the section covered by the present investigation 195 miles in length.

3. The existing project for the St. Francis River, adopted in 1888, provides for the removal of logs, drifts, and snags from the channel and overhanging timber from the banks, and the closing of chutes and sloughs in the Sunken Lands from the mouth to Kennett, Mo., a distance of about 231 miles. St. Francis is 25 miles above Kennett. Operations have been limited for a number of years to the section below Marked Tree, 83 miles below Kennett.

4. As the river varies considerably in its characteristics, the district officer divides it into three sections, (1) above the Sunken Lands, (2) in the Sunken Lands, (3) below the Sunken Lands.

5. *Above the Sunken Lands, 18 miles.*—In this section there is a low-water depth of about 2½ feet, with many logs, snags, and overhanging trees, and a discharge of about 170 cubic feet per second. The district officer states that the most formidable obstruction to navigation is the drift rafts that form in the lower 3 miles. Local interests expended about $4,000 in removing one of these about four and one-half years ago, and there are five such rafts in this section. now. The commerce consists mainly of logs and mill stuffs, the total tonnage being 12,350 tons, of which 12,250 tons were logs. The average haul was 13 miles.

6. *In the Sunken Lands, 81 miles.*—In this section the banks are usually submerged. The stream is divided into a number of poorly defined channels, having depths of not more than 15 inches at an average stage, and but 8 to 10 inches at low water. In addition to the shoals, the river is obstructed by dense growths of rank water grass, which sometimes closes the entire river. Through navigation would be practicable only at high stages, and then with difficulty. The commerce on this section is reported at 12,017 tons, of which 9,330 tons were logs. The average haul was 10 miles.

7. *Below the Sunken Lands, 98 miles.*—In this section the low water flow is from about 225 to 400 cubic feet per second. The controlling depth at ordinary low water is about 12 inches, while in dry years, it is as little as 8 inches. The commerce in 1914 amounted to 149,965 tons, of which 148,010 tons were logs. The average haul was 40 miles.

8. Local interests are improving and bringing under cultivation some of the low-lying lands along the reach of river now under consideration, through the construction of levees and drainage ditches, and it appears that at least some of the interests desire the improve-

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ment of the river largely in aid of this local work. The district officer states that there would be little likelihood of any considerable amount of commerce even if the river were further improved, and he expresses the opinion, based upon navigation interests only, that the river is not worthy of greater attention or expenditures by the General Government than has obtained in the past, and that the present project is ample for all navigation needs present or prospective. In this view the division engineer concurs.

9. Interested parties were informed of the unfavorable report of the district officer and given an opportunity of submitting their views on the subject, but no arguments in favor of the improvement have been received.

10. The St. Francis River from Madison to opposite Kennett is included in the existing project, which provides for improvement by the removal of obstructions and other inexpensive work designed to make the natural depths available, and as it is clear that no more expensive or radical improvement would be justified, the question to be solved is whether the present project shall be extended 25 miles to the town of St. Francis.

11. This section of the river was improved by snagging three different times prior to 1904. The results were local and temporary in character, and it seems that the river has reverted to its original condition. There is but little commerce now, and it is probable that with the further decrease of the timber products, which now constitute by far the greater part of the traffic, the commerce will decline rather than increase.

12. In view of these facts, the board is of the opinion that it is not advisable to extend the project for the improvement of the St. Francis River to the town of St. Francis. Moreover, attention is invited to the board's report of June 15, 1915,[1] submitted under authority of section 14 of the act of March 4, 1915, which concludes as follows:

> Improvement on the St. Francis has been confined practically to the section between the mouth and Marked Tree, 149 miles. The commerce, of which about 97.5 per cent are logs and other forest products, amounts to about 297,000 tons, including that which comes out of the L'Anguille River and Blackfish Bayou.
>
> To continue the improvement as now carried on up to Marked Tree, will require an annual expenditure of about $9,000, and the district officer states that this amount would have to be doubled in order to extend the work through the Sunken Lands, and it would only affect an additional tonnage of about 2½ per cent. Such an expenditure is not thought justifiable. The district officer therefore recommends a modification of the existing project so as to provide for the maintenance of the channel by snagging operations in the St. Francis River, from its mouth to Marked Tree; in L'Anguille River, from its mouth to Marianna; and in Blackfish Bayou, from its mouth to the mouth of Fifteenmile Bayou, at an average annual cost of $9,000. The division engineer concurs with the district officer.
>
> From the information now available, it appears that all reasonable demands of commerce and navigation on these waterways will be met by a project for systematic snagging, over the reaches upon which work has been carried on in recent years; that conditions in the Sunken Lands, physical and commercial, are such that no commensurate returns could be expected from the improvement of this reach; and that it is advisable to omit this section from the project. The board therefore concurs with the district officer and the division engineer and recommends legislation authorizing a modification of the existing project so that it will provide for snagging in the St. Francis, from its mouth to Marked Tree; in the L'Anguille, from the mouth to Marianna; and in Blackfish Bayou, from its mouth to Fifteenmile Bayou, at a yearly cost of about $9,000.

[1] See H. Doc. No. 60, 64th Cong., 1st Sess.

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The board adheres to the recommendation just quoted.

13. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other related subjects which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

PRELIMINARY EXAMINATION OF ST. FRANCIS RIVER FROM MADISON TO ST. FRANCIS, ARK.

UNITED STATES ENGINEER OFFICE,
Little Rock, Ark., August 10, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Preliminary examination of St. Francis River from Madison to St. Francis, Ark.

1. This report covers a preliminary examination of the St. Francis River from Madison, St. Francis County, to St. Francis, Clay County, Ark., provided for by the river and harbor act of March 4, 1915. A sketch map of the portion of the river in consideration accompanies.

2. The St. Francis River has its source in St. Francis County, Mo., whence it flows in a generally southerly direction for about 450 miles to the Mississippi River, 8 miles above Helena, Ark. Madison is 60 and St. Francis 256 miles above the mouth. The portion of the river between these two towns, either in whole or in part, has been the subject of several prior examinations, reference to the reports of which is given in the following tabulation:

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Maumelle Prairie to mouth	House...	60	Forty-first...	Third...	1871	356
Greenville to Maumelle Prairie					1873	476
Greenville to Lester Landing	House...	60	Forty-sixth...	Third...	1881	1481
Greenville to State line					1887	1549
Greenville to Sunk Lands					1895	2040
Sunk Lands to Poplin	House...	82	Fifty-fourth...	Second..	1897	1999
St. Francis to mouth	...do.....	163	Fifty-ninth...	First....	.....	.....
Hodges Ferry to Kennett	...do.....	283	Sixty-third....	...do.....	.....	.....

3. The river from Madison to opposite Kennett, Mo. (25 miles below the town of St. Francis), is included in the current project for improving St. Francis and L'Anguille Rivers and Blackfish Bayou, Ark., the contemplated work under which, in so far as the St. Francis River is involved, being the clearing of the channel to opposite Kennett, Mo., of snags and like obstructions and the closing of chutes

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and sloughs in the Sunken Lands. Operations under this project for many years, however, have been limited to the river below Marked Tree, 83 miles downstream from Kennett. Between Kennett and St. Francis town improvement by snagging operations has been undertaken at three different times. First it was included in a project for improvement from the mouth to St. Francis town; second, in a similar project from Greenville (104 miles above St. Francis town) to Kennett; and third in a project extending from Poplin (Fisk) (58 miles above St. Francis town) to the head of the Sunken Lands. The last-named project was adopted by the river and harbor act of June 13, 1902. It was completed in the fiscal year 1904. An examination having in view a resumption of the improvement above Kennett was made in 1913, the report of which (H. Doc. No. 283, 63d Cong., 1st sess.) was unfavorable.

4. Between Madison and St. Francis (195 miles) the river varies greatly in characteristics, so much so as to suggest a subdivision of this report into three sections, to wit, above the Sunken Lands, in the Sunken Lands, below the Sunken Lands.

ABOVE THE SUNKEN LANDS.

[St. Francis to the head of Varney River, 18 miles.]

5. In this section the available depth at low water, with the river clear of snags and logs, is 2½ feet for a boat 22 feet wide and 88 feet long. The range between high and low water at St. Francis is 19 feet, decreasing to 6 feet at the head of Varney River. The high-water slope is about 1 foot per mile; the low-water slope about three-tenths of a foot per mile. The bank heights at low water at St. Francis and at head of Varney River are about 17 and 3 feet, respectively. There is little variation in the low-water widths between the places named, such widths ranging between 50 and 80 feet. The widths at bank-full stage are about 160 feet and are fairly uniform throughout the section in consideration. The bends are short, sharp, and numerous. The banks are stable. At St. Francis the river passes through Crowleys Ridge, which limits the width of its flood plane to about 550 feet. Immediately below St. Francis overflow waters spilled both right and left before levee construction in this vicinity was initiated, those passing over the right bank running through several sloughs to a return to the main river at different points in the Sunken Lands. The overflow of the left bank made its way into Little River, to be returned to the main river below the Sunken Lands. The ordinary low-water flow at St. Francis town is about 170 cubic feet per second. During extreme low water, following periods of long continued drought, it is reduced to 100 cubic feet per second.

The highest flood of record at St. Francis is estimated to have involved about 9,000 cubic feet per second. There is now in contemplation, however, the construction of a levee along the right bank of the St. Francis River from near Hodges Ferry (73 miles above St. Francis) to near Chalk Bluff (10 miles above St. Francis), which by preventing overflow waters from passing into Black and Cache Rivers (on the west side of Crowleys Ridge)—so I am told—will increase the flood volume at St. Francis by 21,000 cubic feet a second, making its probable total 30,000 cubic feet per second. Levees have been con-

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structed along both banks of the river from St. Francis downstream. That on the right bank extends to near the south line of Greene County, Ark. (mile 200 in the Sunken Lands), and that on the left bank to mile 226 in the Sunken Lands. These levees above mile 231 are now under enlargement to a grade from 2 to 4 feet in excess of that heretofore obtaining. This enlargement is occasioned by the rise of the flood plane resulting from the restriction by the original levees of the flood width. The most formidable obstruction to navigation on the river above the Sunken Lands is the continually recurring drift rafts that form in the lower 3 miles of this section. About four and one-half years ago local interests expended about $4,000 in removing a drift raft near Hampton Slough, 16½ miles below St. Francis. On five prior occasions the United States had opened a boat channel through similar rafts in the same locality. At present there are three such drift rafts aggregating 2,100 linear feet, between Hampton Slough and the head of Varney River.

The section of the stream between Hampton Slough and the town of St. Francis, clear of snags and logs, affords greater low water navigation depths than any other portion of the St. Francis River, and as a general proposition is navigable all the year round by boats of not over 2 feet draft. The commerce on this section consists mainly of the movement of saw logs and rough cooperage stuffs to mills at St. Francis. Occasionally some commerce arises from plantation products. The tonnage last year consisted of 12,250 tons of logs valued at $24,500 and 100 tons of cotton valued at $20,000, a total of 12,350 short tons, of an estimated value of $44,500. The average haul was 13 miles. There are three power boats operating on the section of the river in question, from 30 to 32 feet long, 8 to 14 feet beam, and with drafts varying from 18 inches light to 24 inches loaded. They are employed in cooperation with barges having a maximum load draft of 3½ feet. There are no improved public terminals. The sawmills are equipped with log slips. The river is crossed at St. Francis town by two bridges, one a wagon bridge with a bascule draw giving 36½ feet horizontal clearance in the opening, the other a railroad bridge with swing draw of like clearance.

IN THE SUNKEN LANDS.

[From the head of Varney River to Foot of Lake, 81 miles.]

6. The decrease in bank heights mentioned in connection with the section of the river above the Sunken Lands continues until about 7 miles below the head of Varney River, where the banks are level with the river surface at average stages. From this point to Foot of Lake the banks defining the river channel are submerged, the stream being bordered throughout by marginal swamp locally called the overflow. This overflow varies in width during ordinary stages from a minimum of one-fourth mile to a maximum of nearly 2½ miles and at extreme low water from 600 feet to 1¼ miles. Within these limits the main channel meanders from one side to the other. In many instances the overflow connects with sloughs paralleling the main stream. Most of these sloughs return to the river in the Sunken Lands above Maumelle Prairie (mile 175), but some continue south to a connection with the main river below the Sunken Lands. The

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levee constructed along the right bank from St. Francis town to mile 201 prevents the spread of flood waters to the west so long as it remains intact. During the high-water period of the present year this levee was breached at six places, two above and four in the Sunken Lands. The levee on the left bank from St. Francis town to mile 226 was breached in two places, one above and one in the Sunken Lands. The channel depths during average stages are frequently not in excess of 15 inches; at low water 8 to 10 inches. The range between extreme high and low water is from 5 to 6 feet from the head of Varney River to near Lake City. This is an increase of 1½ to 2 feet in late years, due to the development of the several levee systems. Below Lake City there is a gradual increase in the range until at Foot of Lake it amounts to about 17 feet.

The principal channel obstructions through the Sunken Lands, other than the shoals, are rank growths of water vegetation, the principal form of which is a grass locally called smartweed. This develops in large fieldlike areas, which sometimes close the river entirely. Between such closed sections are found short stretches of open water. This vegetation shows in the river from opposite Kennett, Mo., to Lead Fork. The preponderance of evidence indicates its gradual but persistent extension. A fair general statement of the navigable capacity of the St. Francis River through the Sunken Lands would be that it is not available for through navigation except at high stages and then only with the greatest difficulty, and that at medium and low stages it is navigable only in short disconnected reaches. There is no general or public commerce in the Sunken Lands. Saw logs are floated from near-by points to West Kennett, Bertig, and Lake City. Several farmers own small motor boats, which are utilized in local and restricted movement of farm products and supplies. The water-borne commerce in the Sunken Lands last year consisted of the following:

	Short tons.	Estimated value.
Saw logs	9,330	$18,660
Cotton	137	26,400
Miscellaneous	2,550	25,000
Total	12,017	70,060

The average haul was 10 miles.

There are 27 motor boats within the Sunken Lands, varying from 16 to 24 feet in length, from 3 to 8 feet in beam, and from 5 to 32 inches in draft. In connection with these motor boats there are employed eight small barges or scows, varying from 12 to 50 feet in length, from 6 to 10 feet in beam, and from 4 inches to 20 inches in draft. No improved public terminals exist. Lesters Landing, 190 miles above the mouth of the river, is the practicable head of navigation from points below. In the early days of the settlement of the country steamboats operated regularly to this point whenever sufficient river stage was available, say, about five months during the early part of a calendar year. This navigation has been abandoned by reason of railroad development. No steamboat has operated in the "Sunk Land trade" since 1898. The section of the river in

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discussion is crossed by eight bridges, as shown in the following tabulation:

Name	Location (mile).	Span.	Horizontal clear at low water.	Vertical clear at high water.	Vertical clear at low water.	Type.
			Feet.	*Feet.*	*Feet.*	
New Dog Walk (county)	233.6	Fixed	12½	2.8	6.8	Wooden trestle.
West Kennett (railroad)	230.8	Bascule	28	0	3.4	Do.
Honey Island (county)	228.8	Fixed	12	2.5	6.5	Do.
Palmers (private)	222.2	do	14	3.0	7.0	Log trestle.
Bertig (railroad)	209.3	Swing	34	−1.8	2.4	Plate girder.
Hopkins (county)	206.8	Fixed	22	2.7	7.2	Wooden trestle.
Lake City (county)	185.8	Swing	31	1.2	7.2	Iron trestle.
Lake City (railroad)	185.6	Fixed	14	.2	6.2	Wooden trestle.

BELOW THE SUNKEN LANDS.

[From Foot of Lake to Madison, 98 miles.]

7. At Foot of Lake the bank heights are from 2 to 3 feet during low water, increasing gradually until at Marked Tree, 9 miles below, they are about 17 feet, and at Madison, 89 miles below Marked Tree, about 38 feet. The range between high and low water also increases from about 17 feet at Foot of Lake to 20 feet at Marked Tree and to 42 feet at Madison. At the latter place, however, much of the range is due to backwater from the Mississippi River. The headwaters of the St. Francis would not produce a greater range than 20 feet at Madison, except for the influence of Mississippi River stages. The extreme range at Marked Tree is 26.2 feet (Apr. 4, 1897). This, however, was due to flood waters from the Mississippi River entering into the St. Francis Basin through Little River Basin prior to the completion of the Mississippi River levee system along the St. Francis front. The low-water flow at Marked Tree is about 225 cubic feet per second, at Madison about 400 cubic feet per second. The volume of flood flow is not known. The catchment area above Marked Tree is about 6,200 square miles. The width between banks increases from 200 feet at Marked Tree to 700 feet at Madison, the low-water widths varying from 150 to 225 feet in the pools and from 75 to 125 feet on the shoals. The controlling depths at ordinary low water are but about 12 inches, and in years of great drought as little as 8 inches. The navigation period for boats of 2 feet draft is about 9½ months a year, and for 4 feet about 8½ months, generally beginning during the month of November and ending during the month of August. The commerce on the section of river in discussion consists mainly in the movement of saw logs, mostly in raft. Last year this commerce comprised:

	Short tons.	Estimated value.
Saw logs	148,010	$296,020
Cotton	905	181,000
Mussel shells	1,050	23,100
Total	149,965	500,120

Average haul, 40 miles.

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Forty-five motor boats have their home ports at either Marked Tree, Parkin, or Madison. They vary in size from 14 to 60 feet of length, 3 to 14 feet beam, and 8 inches to 4 feet draft. During medium and high stages Mississippi River towboats frequently ascend the river to above Parkin for logs. There are no improved public water terminals. The sawmills at Marked Tree, Parkin, and Madison are provided with log slips and derricks for private use. This section of the river is crossed by five bridges as tabulated below:

Location.	Mile.	Type.	Horizontal clearance.
Marked Tree	151.4	Railway, swing draw	60
Do	148.5	Highway, swing draw	70
Parkin	99.8	Railway, swing draw	118
Madison	60.0	Highway, swing draw	90
Do	59.7	Railway, swing draw	78

GENERAL STATEMENT.

8. The river and harbor act which directed this examination, not having specified the extent of improvement contemplated, inquiry was made of interested parties. Their statements varied greatly, ranging from a desire for an examination having in view the clearing of the channel through the Sunken Lands of removable obstructions (logs, drifts, etc.), to a comprehensive instrumental survey, with estimate of cost, for completely opening and maintaining the river channel for general drainage, whereby may be accomplished the reclamation of the Sunken Lands. In the efforts to reclaim the wet lands bordering the river between St. Francis and Marked Tree, the local and neighboring interests, by means of levee and drainage district organization, have constructed levees down the right bank of the river from the town of St. Francis to the south line of Greene County, Ark., and down the left bank to midway of Two-mile Island, west of Kennett, Mo. The latter levee is now under extension to a terminus on the left bank of the river 37 miles below St. Francis. It will completely separate Varney River from the St. Francis River. Another levee district proposes the construction of a levee, which will virtually be an extension of that last mentioned, to the vicinity opposite Lake City. In Clay and Greene Counties, Ark., between St. Francis River and Crowley's ridge, similar local organizations have constructed 52 miles of drainage ditches. Other such ditches have been constructed in Craighead County to the west of St. Francis River, but I am not informed as to their extent.

Surveys and plans are in preparation for approximately 67.5 miles of ditches in Craighead County east of the St. Francis River, two of which will be continuations of existing ditches (totaling 24 miles) in Dunklin County, Mo. It is represented that the levees together with the drainage now provided have reduced the continuously wet land area to about 55,000 acres as against 250,000 acres of like land 10 years ago. In the same period the cultivated areas are stated to have increased from about 115,000 to about 290,000 acres, and the available standing timber to have been reduced from 2,000,000,000 to 920,000,000 feet. The removal of this timber carries with it, of

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course, a progressive reduction of the principal tonnage items of commerce. It is a well-known fact that purely agricultural countries such as this section is destined to be, do not produce much river commerce when well supplied with railroad facilities such as exist in the territory in question. From this fact it follows that there would be little likelihood of any considerable increase in volume of commerce even were the river through the Sunken Lands made available to navigation to the full extent obtainable by the small low water volume. In view of the above, it is my opinion, considering only the viewpoint of navigation, that the river is not worthy of greater attention or expenditure by the General Government than has obtained in the past, and that the present project for improving St. Francis and L'Anguille Rivers and Blackfish Bayou is amply comprehensive for all navigation needs, present or prospective. As to the corelated plan, i. e., opening the river through the Sunken Lands for drainage purposes, sufficient information is not at hand to justify a statement regarding its feasibility or value. For a thorough and comprehensive investigation of this phase of the subject, approximately 1,500 miles of level and transit surveys at a probable cost of $25,000 would be required. Since this corelated subject has little if any bearing upon navigation interests it is recommended that such a survey be not considered.

9. No questions of water-power development, improvement of terminal facilities, or allied subjects are involved in this examination.

10. List [1] of names of persons to whom notice of this adverse report has been sent accompanies.

E. M. MARKHAM,
Major, Corps of Engineers.

[First indorsement.]

OFFICE DIVISION ENGINEER, WESTERN DIVISION,
St. Louis, Mo., August 10, 1915.

To the CHIEF OF ENGINEERS, U. S. ARMY:

1. Concurring in the views and recommendations of the district officer.

C. McD. TOWNSEND,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 3.]

[1] Not printed.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 59.

SMITHS CREEK, N. C.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON REEXAMINATION OF SMITHS CREEK, N. C.

DECEMBER 7, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 7, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith, a letter from the Chief of Engineers, United States Army, dated 4th instant, together with copy of a report from Capt. C. S. Ridley, Corps of Engineers, dated August 30, 1915, with map, on reexamination of Smiths Creek, N. C., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 4, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Reexamination of Smiths Creek, N. C.

1. Under authority of section 14 of the river and harbor act approved March 4, 1915, there is submitted herewith for transmission to Congress report dated August 30, 1915, with map, by Capt. C. S. Ridley, Corps of Engineers, relative to the project for improvement of Smiths Creek, N. C.

2. Smiths Creek is a small tributary of Neuse River. The original and present project, adopted by the act of June 25, 1910, provides for the excavation of a basin 10 feet deep at mean low water at the town of Oriental, and removing several lumps and projecting points

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in the entrance channel, at an estimated cost of $16,250. The plan contemplated the deposit of dredged material behind a bulkhead to be built by local interests and located in such a manner as to protect the dredged area and to decrease the exposure at the mouth of the creek. A bulkhead was constructed by the town, but failed before the fill behind it had been completed. Upon the failure of local interests to repair the bulkhead, dredging operations were terminated. The commerce of the locality has decreased in the last few years, and two important plants have ceased operation. Having in mind the small and decreasing commerce, and the failure of local interests to build and maintain a satisfactory bulkhead and public wharf, as required by the act adopting the project, the district officer deems it inadvisable to continue this improvement, and he recommends that the project be abandoned. The division engineer and the Board of Engineers for Rivers and Harbors concur in this opinion and recommendation.

3. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore recommend that legislation be enacted authorizing the abandonment of the project for improving Smiths Creek, N. C.

DAN. C. KINGMAN,
Chief of Engineers, U. S. Army.

REPORT OF BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 15, 1915.

The CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. This report on Smiths Creek, N. C., is submitted under authority of that portion of section 14 of the act of March 4, 1915, which reads, "and the Chief of Engineers is directed to make a report upon any other projects, river or harbor, the further improvement of which under present conditions is undesirable, or in which modifications of the plans or project should be made."

2. This creek is a tributary of the Neuse, which it enters about 10 miles above the mouth of the latter. The town of Oriental is situated quite near the mouth of the creek, and the existing project, adopted by the act of June 25, 1910, is for the improvement of the harbor at this place. It provides for the excavation of a basin in the small bay, located in the center of the town and just inside the mouth of the creek, to the depth of 10 feet at mean low water and removing several lumps and projecting points in the entrance channel, at an estimated cost of $16,250, with $1,000 annually for maintenance, provided local interests construct a bulkhead of sheet piling in two rows 300 feet apart for the deposit of dredged material, and also that said local interests shall provide at least one public wharf of adequate facilities.

3. A bulkhead was constructed by local interests, but it failed before the dredging was completed. These interests were called upon to make repairs, and upon their failure to do so the dredging was terminated. The bulkhead has practically disappeared and shoaling has taken place in the harbor. A wharf consisting of a

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wooden sheet pile bulkhead with filling behind it was constructed by local interests, but this is now in poor condition and is apparently lapsing into a state of complete disrepair.

4. The commerce has decreased from 40,591 tons in 1910, when the project was adopted, to 3,545 tons in 1914. This commerce is now carried in small boats which do not require the project depth. In view of the great decrease in commerce, of the failure of local interests to provide a satisfactory bulkhead and wharf, the district officer recommends the abandonment of the project. He also recommends that the balance of funds now available be expended in maintaining the present depth in the harbor proper and in the natural channel of approach, and that further expenditures of Government funds be then stopped. The division engineer concurs in recommending the abandonment of the project, but does not concur with regard to the expenditure of available funds, as he sees no necessity for maintaining present depths.

5. It appears from the report of the district officer that commercial conditions have greatly changed since the adoption of the project for the improvement of this harbor. There was then a thriving and prosperous business which promised to expand and become of considerable general importance. Due apparently to the closing of one large industry and the destruction of another by fire, the opposite has been the case. Commerce has decreased very greatly and has assumed a local character that does not require a depth as great as that called for by the existing project. Moreover, local interests have apparently not found it to their advantage to provide an efficient and satisfactory bulkhead and public wharf, as contemplated by the act adopting the project. Without these adjuncts the dredging would be of little value and short lived. In view of these conditions the board recommends legislation authorizing the abandonment of the project for Smiths Creek, N. C., and the return of any available balance of funds to the Federal Treasury.

For the board:

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

REEXAMINATION OF SMITHS CREEK, N. C.

UNITED STATES ENGINEER OFFICE,
Wilmington, N. C., August 30, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Abandonment or modification of river and harbor projects, Smiths Creek, N. C.

1. This is a report on Smiths Creek, N. C., submitted in compliance with instructions.

2. Smiths Creek is a small tributary of Neuse River, lying wholly within Pamlico County, N. C. It enters the Neuse on the north side, opposite the mouth of Adams Creek, the northern terminus of the waterway from Pamlico Sound to Beaufort Inlet, and about 10 miles above the mouth of the Neuse. The stream is navigable for 5 or 6 miles above Oriental, but the only portion under improvement is the harbor at the mouth.

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3. The present project, adopted by the river and harbor act of June 25, 1910, provides for the excavation of a basin in the small bay located in the center of the town and just inside the mouth of the creek, to a depth of 10 feet at mean low water, and removing several lumps and projecting points in the entrance channel, at an estimated cost of $16,250, with $1,000 annually for maintenance. (See H. Doc. No. 774, 61st Cong., 2d sess., with map.) The plan for improvement contemplated the deposit of dredged material behind a bulkhead located in such a manner as to protect the dredged area and to decrease the exposure at the mouth of the creek.

4. When the present project was under consideration, it was recognized that local interests would be greatly benefited by the improvement and the Chief of Engineers recommended the project to Congress at the full estimated cost of $23,750, of which local interests should be required to contribute $7,500, the estimated cost of the bulkhead. In adopting the project Congress appropriated $16,250 and required local interests to construct the bulkhead. The effect of this change was to remove the actual construction of the bulkhead from the jurisdiction of this department and to place it in the hands of men unskilled in work of this character. A bulkhead was constructed by the town which failed before the fill behind it had been completed.

5. When the bulkhead would no longer retain the dredged material, the local interests were called upon to repair it, and on their failure to do so, the contract for dredging was terminated by supplemental agreement. There is transmitted herewith a map showing the conditions in the harbor proper in June, 1914, and which is believed to substantially represent present conditions. The dredging contractor had dredged the entire area, with the exception of the shaded portion on the north side, to the project depth when his contract was terminated. At present the major portion of the bulkhead has entirely disappeared, due to the effects of a severe storm in 1913.

6. The amount and value of the commerce at this place is shown by the following table:

Calendar year.	Tonnage.	Value.	Calendar year.	Tonnage.	Value.
1908	72,915	$789,551	1912	14,226	$255,514
1910	40,591	381,050	1913	2,935	116,788
1911	17,168	235,994	1914	3,545	185,417

In 1910 the Defiance Box Co. closed their plant and in October, 1912, the plant of the Roper Lumber Co. was destroyed by fire and abandoned.

7. The details of the commerce for 1914 are shown in the following table:

Vessel classification.

Classes.	American.	Net registered tonnage.
Registered:		
Steamers	2	102
Barges	3	950
Gasoline	15	180
Sailing	8	64
Total	28	1,296

Number of passengers transported during the year, 590.

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Freight traffic.

Commodities.	Amount.		Valuation.
	In customary units.	In short tons.	
OUTBOUND.			
Cattle	25 head	6	$600.00
Cotton	94 bales	24	6,120.00
Crossties	350	22	176.00
Cotton seed	168 tons	168	3,360.00
Eggs	54 crates	1	300.00
Empty oil barrels	92	3	75.00
Fish, fresh	31 boxes	3	300.00
Furniture	10 tons	10	1,250.00
Gasoline	800 barrels	140	6,580.00
Groceries	41 tons	41	4,100.00
Grain	175 bushels	4	128.00
Hogs	11 head	1	200.00
Hardware	11 tons	11	1,540.00
Lumber	27,000 feet, b. m	54	405.00
Potatoes, Irish	948 bushels	28	924.00
Potatoes, sweet	191 bushels	6	180.00
Poultry	2,106 head	4	800.00
Shingles	17,300	9	90.00
Tar	35 barrels	5	75.00
Timber	215,000 feet, b. m	645	1,612.50
Tiling	45 tons	45	450.00
Vegetables	477 packages	24	600.00
Total		1,254	29,865.50
INBOUND.			
Brick	4,500	11	33.00
Cement	16 tons	16	136.00
Coal	23 tons	23	92.00
Cotton	114 bales	29	7,395.00
Cotton seed	2 tons	2	40.00
Cottonseed hulls	85 tons	85	680.00
Cottonseed meal	95 tons	95	2,565.00
Fertilizer	193 tons	193	5,790.00
Furniture	11 tons	11	1,375.00
Fish, fresh	10,500 boxes	1,050	105,000.00
Fish, salt	150 barrels	8	800.00
Grain	1,909 bushels	48	1,536.00
Gasoline	10 barrels	2	94.00
Groceries	133 tons	133	12,300.00
Hardware	19 tons	19	2,660.00
Hay	43 tons	43	1,032.00
Kerosene	9 barrels	2	54.00
Lime	49 barrels	6	42.00
Lumber	34,500 feet, b. m	69	517.50
Machinery	3 tons	3	300.00
Oysters	2,500 bushels	100	1,250.00
Potatoes, Irish	5,750 bushels	173	5,709.00
Potatoes, sweet	3,750 bushels	113	3,390.00
Poultry	1,000 head	2	400.00
Soft drinks	586 crates	37	1,184.00
Shingles	2,500	1	10.00
Salt	200 sacks	14	112.00
Tar	15 barrels	2	30.00
Vegetables	27 packages	1	25.00
Total		2,291	155,551.50
RECAPITULATION.			
Total outbound		1,254	29,865.50
Total inbound		2,291	155,551.50
Grand total		3,545	185,417.00

The item of fish constitutes 30 per cent of the total tonnage and 56 per cent of the total valuation.

The above commerce is all carried in small boats, and there is no present demand for the depth as stated in the present project.

8. The act appropriating funds for this improvement provided that local interests construct at least one public wharf of adequate facilities, the use of which was to be open to all on equal terms.

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The town of Oriental executed an agreement (approved by the Secretary of War, Jan. 19, 1911) to establish and maintain in perpetuity a public wharf with adequate shipping facilities and to permit all water craft to use the said wharf on equal terms for reasonable rates of compensation. In accordance with this agreement a bulkhead of wooden sheet piling was constructed at the north end of the dredged area, the low land north of it partially filled with dredged material, and a public thoroughfare opened about on the line of the causeway shown on the original map. An inspection of this wharf, made August 17, 1915, shows it to be in very poor condition. The round piles in the face of the bulkhead are badly eaten, and the sheet piling in many places is cut in two by the teredo, and the public thoroughfare is considerably below the level of the adjacent streets.

9. It is believed that this improvement was originally undertaken principally on account of the large manufacturing interests then located at Oriental, which enabled it to show a large commerce, nearly $800,000 per annum. Conditions are now essentially different as explained in paragraph 6 above, and the annual commerce is less than one-fourth of what it was when the project was adopted. Conditions with respect to this town being a stopping place for traffic between Norfolk and Beaufort by the inland waterway have also assumed a different status since the consideration of the Pungo River route has been taken up, this making Belhaven a logical and better situated stopping point for supplies.

10. In view of the great decrease in the commerce of this locality and its present small amount and character, the failure of local interests to build and maintain a satisfactory bulkhead as contemplated in the river and harbor act of June 25, 1910, thus preventing the completion of the improvement, and the failure of the town of Oriental to maintain an adequate public wharf in accordance with their agreement, it is not deemed advisable to continue this improvement, and it is therefore recommended that the project be abandoned. There is available to the credit of this appropriation about $2,900. The present and prospective commerce and the attitude of the local interests do not warrant the continued maintenance of the project depth. It is therefore further recommended that the available funds be applied to maintaining the present depths in the harbor proper and the natural channel in the approach from the Neuse River thereto until these funds are exhausted, after which all further expenditure of Government funds in this locality should be stopped.

11. Existing terminal facilities (see H. Doc. No. 226, 63d Cong., 1st sess., p. 657), while few in number and in poor condition, are considered adequate for the existing commerce. A photograph of the bulkhead before its failure appears in the above report as "Smiths Creek No. 1." The wharf of the Norfolk Southern Railroad, No. 4, has been destroyed by storm; Nos. 5, 6, and 7 are in bad condition, due to the fire at the Roper mill.

12. There are no questions of waterpower or other subjects so related to the project that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interest of navigation.

C. S. RIDLEY,
Captain, Corps of Engineers.

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[First indorsement.]

OFFICE DIVISION ENGINEER, SOUTHEAST DIVISION,
August 31, 1915.

The CHIEF OF ENGINEERS:

1. I concur in the recommendation of the district officer that this project be abandoned. I can see no advantage, however, in spending the present available funds in the maintenance of existing depths, which apparently are not shoaling rapidly. I therefore do not concur in that part of his recommendation.

W. C. LANGFITT,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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WILMINGTON, N. C.

TO ACCOMPANY MY R
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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 60.

ST. FRANCIS AND L'ANGUILLE RIVERS, AND BLACKFISH BAYOU, ARK.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON REEXAMINATION OF ST. FRANCIS AND L'ANGUILLE RIVERS AND BLACKFISH BAYOU, ARK.

DECEMBER 7, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 7, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated 4th instant, together with copies of reports from Maj. A. B. Putnam, Corps of Engineers, and the Board of Engineers for Rivers and Harbors, dated May 12, 1915, and June 15, 1915, with map, on reexamination of St. Francis and L'Anguille Rivers and Blackfish Bayou, Ark., made in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 4, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Reexamination of St. Francis and L'Anguille Rivers, and Blackfish Bayou, Ark.

1. Under authority contained in section 14 of the river and harbor act approved March 4, 1915, there are submitted herewith for trans-

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mission to Congress report dated May 12, 1915, with map, by Maj. A. B. Putnam, Corps of Engineers, and report dated June 15, 1915, by the Board of Engineers for Rivers and Harbors, relative to the project for improvement of St. Francis and L'Anguille Rivers, and Blackfish Bayou, Ark.

2. The improvement of the St. Francis River was begun in 1871. The existing project provides for the removal of snags and similar obstructions in St. Francis River from its mouth to Kennett, Mo., in L'Anguille River from its mouth to Marianna, and in Blackfish Bayou from its mouth to Fifteenmile Bayou; also for closing chutes and sloughs in the Sunken Lands of the St. Francis, the expenditures on Blackfish Bayou to be limited to $500 a year. For a distance of about 80 miles below Kennett, the St. Francis flows through the Sunken Lands, where the river is divided into several very small channels, all of which are shallow, narrow, and greatly obstructed. The commerce of this section amounts to about 6,500 tons annually, and no work has been done here for many years, improvement having been confined practically to the section between the mouth and Marked Tree, where there is a commerce of about 297,000 tons. The annual cost of the work below Marked Tree is about $9,000, and the district officer states that this amount would have to be doubled to extend the work through the Sunken Lands. He is of opinion that such an expenditure is not justified, and therefore recommends that the section of river above Marked Tree be dropped from the project. The division engineer and the Board of Engineers for Rivers and Harbors concur in this view.

3. After due consideration of the above-mentioned reports, I concur with the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore recommend that legislation be enacted authorizing a modification of the existing project so that it will provide only for snagging in the St. Francis River, from its mouth to Marked Tree; in L'Anguille River, from its mouth to Marianna; and in Blackfish Bayou, from its mouth to Fifteenmile Bayou, at a yearly cost of about $9,000.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
June 15, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. This report on St. Francis and L'Anguille Rivers and Blackfish Bayou is submitted under authority of that portion of section 14 of the act of March 4, 1915, which reads, "and the Chief of Engineers is directed to make a report upon any other projects, river or harbor, the further improvement of which under present conditions is undesirable, or in which modifications of the plans or projects should be made."

2. L'Anguille River and Blackfish Bayou are tributaries of the St. Francis River, the former entering it 12 miles and the latter 38

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miles above its mouth. The improvement of these tributaries is carried on in connection with work on the main stream, the project providing for the removal of snags and similar obstructions in the St. Francis from its mouth to Kennett, Mo., 231 miles; in the L'Anguille from its mouth to Marianna, 8 miles; and in Blackfish Bayou from its mouth to Fifteenmile Bayou, 6 miles; also for closing chutes and sloughs in the Sunken Lands of the St. Francis, the expenditures on Blackfish Bayou to be limited to $500 a year.

3. For a distance of about 80 miles below Kennett the St. Francis flows through the Sunken Lands, where the river is divided into several very small channels, none of which is well defined and all are shallow, narrow, and greatly obstructed. No work has been done on this section for many years and there is very little commerce, the total reported being 6,512 tons, of which 3,750 tons were log, pile, and pole rafts, which could be handled at medium and higher stages without improvement.

4. Improvement on the St. Francis has been confined practically to the section between the mouth and Marked Tree, 149 miles. The commerce, of which about 97.5 per cent are logs and other forest products, amounts to about 297,000 tons, including that which comes out of the L'Anguille River and Blackfish Bayou.

5. To continue the improvement as now carried on up to Marked Tree will require an annual expenditure of about $9,000, and the district officer states that this amount would have to be doubled in order to extend the work through the Sunken Lands, and it would only affect an additional tonnage of about 2½ per cent. Such an expenditure is not thought justifiable. The district officer therefore recommends a modification of the existing project so as to provide for the maintenance of the channel by snagging operations in the St. Francis River from its mouth to Marked Tree; in L'Anguille River from its mouth to Marianna; and in Blackfish Bayou from its mouth to the mouth of Fifteenmile Bayou, at an average annual cost of $9,000. The division engineer concurs with the district officer.

6. From the information now available, it appears that all reasonable demands of commerce and navigation on these waterways will be met by a project for systematic snagging over the reaches upon which work has been carried on in recent years; that conditions in the Sunken Lands, physical and commercial, are such that no commensurate returns could be expected from the improvement of this reach; and that it is advisable to omit this section from the project. The board therefore concurs with the district officer and the division engineer and recommends legislation authorizing a modification of the existing project so that it will provide for snagging in the St. Francis from its mouth to Marked Tree; in the L'Anguille from its mouth to Marianna, and in Blackfish Bayou from its mouth to Fifteenmile Bayou, at a yearly cost of about $9,000.

For the board.

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

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REEXAMINATION OF ST. FRANCIS AND L'ANGUILLE RIVERS AND BLACKFISH BAYOU, ARK.

UNITED STATES ENGINEER OFFICE,
Little Rock, Ark., May 12, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: St. Francis and L'Anguille Rivers and Blackfish Bayou, Ark.; revision of project.

1. The following report upon the advisability of modifying or abandoning the present project for the improvement of St. Francis and L'Anguille Rivers and Blackfish Bayou, Ark., is submitted.

2. There have been several examinations made of these rivers, as listed below:

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Maumelle Prairie to mouth [1]	House	60	Forty-first	Third	1871	356
Greenville to Maumelle Prairie [1]					1873	476
Greenville to Lester Landing [1]	House	60	Forty-sixth	Third	1881	1,481
Greenville to State Line [1]					1887	1,549
Greenville to Sunk Lands [1]					1895	2,040
Sunk Lands to Poplin [1]	House	82	Fifty-fourth	Second	1897	1,990
Mouth to Wittsburgh and Marianna [2]	do	125	Fifty-fifth	do	1898	1,678
Greenville to mouth of Mingo [1]	do	41	Fifty-sixth	First	1900	2,618
Kennett to mouth [1]	do	163	Fifty-ninth	do		
Mouth of St. Francis to Marianna on L'Anguille [1]	do	1,069	Sixty-second	Third		
Mouth to Madison and Marianna [2]	do	45	Sixty-third	First		
Blackfish Bayou, St. Francis River, to mouth of Fifteen-mile Bayou. [2]	do	73	Sixty-first	do		
Hodges Ferry to Kennett [2]	do	283	Sixty-third	do		

[1] No maps.
[2] With maps.
[3] Basis of project adopted by Congress. The reports covering the section "Hodges Ferry to Kennett," "Kennett to Mouth," and "Mouth to Madison and Marianna," are full reports covering much detail, therefore, a brief general description of the rivers here is assumed to comply with the instructions that this report shall be treated in the same manner as a report on a preliminary examination. In this general description each river will be treated separately.

3. The St. Francis River has its source in the Ozark Mountains in St. Francois County, Mo., whence it flows in a southerly direction 460 miles to the Mississippi River, 8 miles above Helena, Ark. In the first 120 miles of its course it is a mountainous stream, flowing through the St. Francis Mountains, spurs of the Ozarks. From Wappapello, where it leaves the mountains, it flows through flat lands in a bed with banks 22 to 24 feet high at low water near Wappapello, gradually reducing in height to 2 feet at low water at the head of the Sunken Lands, 103 miles below Wappapello. Through the Sunken Lands, 89 miles, the river has no well-marked channel, it being bordered all along in this section with marginal swamps, and for about one-half of its length in this section the channel is nearly choked and closed by weeds and moss. Beginning at Foot of Lake at the lower end of the Sunken Lands, the river is again in one well-marked bed, with banks increasing rapidly in height from about 3 feet in that vicinity to 40 and 45 feet at the mouth of the river, 158 miles below. The ranges

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between high and low water are 24 feet at Wappapello, reducing to 3 feet in the Sunken Lands, then increasing to 60 feet at the mouth of the river. The great range at the mouth is due to flood stages in the Mississippi River. It is doubtful if the St. Francis with its own waters would produce a range of over 22 feet at its mouth. The low-water flow is about 100 cubic feet a second near Wappapello, increasing to about 900 cubic feet a second at the mouth of the river. The Sunken Lands divide the river into two parts, so far as navigability is concerned. Wappapello is the head of boat navigation above the Sunken Lands. Greenville, 21 miles farther up, is the head of navigation for rafts. Lester Landing (now Claunch), in the Sunken Lands, was in the early days considered the head of navigation for that portion of the river in and below the Sunken Lands. The portion of the river between Claunch (Lester Landing) and the head of the Sunken Lands was used only for the passage of boats moving from one navigable section to the other. The portion of the river included in the present project extends from the mouth of the river to Kennett, Mo., 231 miles, the upper 73 miles of which are in the Sunken Lands. Kennett, or rather West Kennett, is 40 miles above Lester Landing.

As to the depths available for navigation in the portion of the river covered by the existing project, they are small during the low-water period, the depths available at that time being about 16 inches for the first 22 miles from the Mississippi, then about 12 inches to Marked Tree (149 miles from the Mississippi), then 8 to 10 inches from there to Lester Landing, 42 miles farther. In this last stretch the available width at these depths is not over 10 feet. In the early days, before the Sunken Lands were crossed by and paralleled by railways, small steamboats of about 12 inches light draft and 2 feet load draft operated to Lester Landing about 7 months each year. In its present condition the river is navigable by boats of 3 feet draft from the mouth to Marked Tree (149 miles) 8 to 11¾ months a year; the average for a 7-year period is 10 months a year. The months in which the river is likely to be too low for 3-foot navigation are August, September, October, and November. The original project, adopted by act of March 3, 1871, contemplated improvement from the mouth to Wittsburg by snagging operations. For the period 1873–1882 the appropriations were made for this work in connection with White River, Ark. By act of June 14, 1880, appropriation was made for improving the river from Wittsburg to Lesters Landing, the project for the expenditure of this appropriation being to cut a channel through "The Lake" and clear the river of obstructions by snagging operations. Appropriation made by act of July 5, 1884, was the first separate appropriation for the entire river. The act did not state the limits within which it was to be applied. Under it snagging operations were carried on to the town of St. Francis, Ark., and several of the sloughs or side channels were closed. When the improvement of St. Francis River, Mo., was begun (act of Aug. 11, 1888), Kennett, Mo., was taken for the upper limit of this work, making the existing project—

removal of logs, drifts, and snags from the channel and overhanging timber from the banks from the mouth to Kennett, Mo., and closing the chutes and sloughs in the Sunken Lands, so as to make the river navigable at high stages to Kennett, Mo., at medium stages to Marked Tree, and at low stages to a point 30 miles below Madison, Ark., the estimated cost being $8,000 annually.

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4. The St. Francis River below Kennett, Mo., is crossed by bridges as follows:

Location of bridge.	Miles from mouth.	Kind of bridge.	Navigation clearances.		
			Horizontal clearances.	Vertical clearances.	
				At high water.	At low water.
			Feet.	*Feet.*	*Feet.*
West Kennett	231	Railway, bascule draw	28	.....	.....
Honey Island	229	Highway, fixed trestle	12	3	6.5
Drag Over	222	do	14	3	7
Bertig	209	Railway, swing draw	34	.....	.....
Senaca Island	207	Highway, fixed trestle	22	3.2	7.2
Lake City	186	Highway, swing draw	31	.....	.....
Do	186	Railway, fixed trestle	14	2.2	6.2
Marked Tree	151	Railway, swing draw	60	.....	.....
Do	148	Highway, swing draw	70	.....	.....
Parkin (near)	100	Railway, swing draw	118	.....	.....
Madison	60	Highway, swing draw	90	.....	.....
Do	60	Railway, swing draw	84	.....	.....
Soudan Landing	29	Railway, lift draw	152	70	119

5. The L'Anguille River has its source in Poinsett and Craighead Counties, Ark., whence it flows in a southerly direction to St. Francis River, emptying into that stream 12 miles from the Mississippi River. Its navigable portion extends from the St. Francis River to Marianna, 8 miles. The low water flow is about 60 cubic feet a second and the river is not navigable during lowest water. The navigable stages are controlled by the stages of the Mississippi River the backwater from which gives 3-feet navigation to Marianna whenever the Helena gauge reads 12 feet or more. The navigation period to Marianna for boats of 3-feet draft averages 8½ months a year, varying from 6 months to 11 months a year. March, April, May, and June are the months which can always be depended upon as affording navigable stages. Nonnavigable stages are liable to occur in any of the other months. The average condition is that the navigable stages begin about the middle of January and continue until about the middle of September. By acts of June 18, 1878, March 3, 1879, and June 14, 1880, a total of $17,000 was appropriated for snagging operations on L'Anguille River to Marianna. This was finally expended in fiscal year ending June 30, 1887. Act of June 13, 1902, revived this work and included it with St. Francis River. Therefore the existing project is to improve the river from its mouth to Marianna, 8 miles, by snagging operations, no estimate for completion or annual estimate for maintenance being stated.

6. Blackfish Bayou has its source in Crittenden County, Ark., whence it flows in a southwesterly direction to near the south line of St. Francis County, where it empties into the St. Francis River, at 38 miles from the Mississippi River. Fifteenmile Bayou, about 6 miles from St. Francis River, is the head of boat navigation. Rafts are floated during flood stages, from points 30 to 40 miles farther up. It, like the L'Anguille, is not navigable during low water periods and also, like the L'Anguille, receives its navigable stages by backwater from the Mississippi River, excepting that occasionally headwaters

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from the St. Francis produce navigable stage in Blackfish Bayou when the Mississippi is low. Also like the L'Anguille, this stream during high stages is navigated by the large Mississippi River boats. The existing project, adopted by the river and harbor act of June 25, 1910, in accordance with report printed in House Document No. 73, Sixty-first Congress, first session, provides for the removal of snags and overhanging timber obstructing the channel in connection with similar work now being done on the St. Francis River, at an estimated cost of $500 annually, and the said act provides that of the consolidated appropriation made not exceeding that sum may be expended, in the discretion of the Secretary of War, for the purpose stated.

7. As these streams are worked under one appropriation title, the expression for the adopted and existing project is:

Remove snags and similar obstructions in St. Francis River from its mouth to Kennett, Mo.; in L'Anguille River from its mouth to Marianna; and in Blackfish Bayou from its mouth to Fifteenmile Bayou; also to close chutes and sloughs in the Sunken Lands of the St. Francis. The expenditures on Blackfish Bayou to be limited to $500 a year.

8. There is little direct competition between the river and railways, most of the river commerce being tonnage moved to rail points at places where the river is crossed by the main lines of the railways. The exception to this is in the lower section of the valley below Madison. Here a large part of the commerce arising along the river is taken to Mississippi River points—Cairo, Memphis, and Helena—the cost of the river movement being slightly less than the cost by rail. Some years ago the Arkansas Legislature established a railway commission to supervise and control intrastate railway freight and passenger rates. The tariff established by that commission was based on length of haul, and river points were not considered as such in making the tariff. This tariff led to lawsuits, the railway companies claiming it was not remunerative, therefore confiscatory. Subsequently the United States district court ordered a tentative tariff known as the "Court tariff." This, like the original one, was based on length of haul, river points being ignored as competitive points. Recently the St. Louis & San Francisco has shown to the district court that the existing intrastate tariffs, both freight and passenger, are not remunerative, and it has established new rates about 30 per cent higher than the Arkansas Railway Commission tariff. On the other hand, the railway commission is preparing another standard distance tariff to be issued late in this month. This tariff will be higher than its old tariff, but lower than the St. Louis & San Francisco Railway tariff. It is rumored that all the railways in the State are to follow the St. Louis & San Francisco in establishing higher rates, and that all will unite in seeking an injunction against the application of the forthcoming State standard distance tariff. In any event, indications are that intrastate freight rates are to be higher in the future than they have been for the past few years. It may be that under this increase there will be a greater movement by river than has existed lately. It is also understood that there is a general effort being made by the railways for an increase in interstate rates. If these be put in effect, there will be still further inducements for a

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greater movement of freight by river. At present, and with the present rail rates, the river rate is slightly lower than rail rate, but not enough lower to cause any marked diversion of freights from rail to water.

9. Although the project for improving St. Francis River includes 73 miles of the Sunken Lands, no improvement work has been done above Marked Tree (10 miles below the Sunken Lands) for many years and that portion of the stream has not been included in the commercial reports each year as has been the portion of the stream below Marked Tree. The commerce in the Sunken Lands below Kennett consists of logs, piling, and telephone poles floated to Bertig, Lake City, and Marked Tree, and of the movement of plantation products and supplies. In the latter case the commerce is moved in small gasoline launches, pole boats, and canoes, and it generally consists of movement by individuals of their own property to the nearest railway point. In some instances the commercial movement is nothing more than ferriage. The approximate tonnage in the Sunken Lands below Kennett is about as follows:

	Short tons.	Estimated value.
Rafted logs, piling, and poles	3,750	$7,500
Cotton	212	42,400
Unclassified (live stock, provisions, feed, etc.)	2,550	30,000
Total	6,512	79,900

In this small commerce, distributed over 81 miles of river, much of which not being traversed at all, is found the reason that no work has been done toward improving the river above Marked Tree in late years. A considerable area of the portion of the Sunken Lands known as St. Francis Lake or Hatchie Coon Sunk Lands was unsurveyed Government land until a couple of years ago, when the land surveys or sectionizing were completed in this section. Since then the land has been opened to settlement under the laws pertaining to original entry and homestead. As they are now becoming subject to individual ownership, there will be increase in population and products. The first increase in products will be in that of logs and other forest products. Sawmill and stave men at Marked Tree and Parkin state that they will receive during the coming year about 13,000,000 feet (45,500 tons) of timber from the Sunken Lands below head of Hatchie Coon Island. Because of the low-water conditions that exist in this portion of the river during about six months of the year, they contemplate that this must be moved during the five months of high-water period. The head of Hatchie Coon is 27 miles above Marked Tree. This seems to be the only indication of any increase in commerce in the Sunken Lands. Since it arises from homesteaders clearing farm lands, it will be a short-lived increase.

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Below Marked Tree the average commerce of the St. Francis and L'Anguille Rivers and Blackfish Bayou, based on the last five-year period, is:

Article.	Customary units.	Short tons.	Estimated value.	Average haul.
				Miles.
Cooperage stuff		945	$7,090	40
Cotton	2,020 bales	505	100,880	32
Cotton seed	15,000 sacks	810	20,250	32
Grains	34,990 bushels	975	14,565	35
Groceries		1,450	262,185	30
Live stock and cattle	555 head	225	29,740	31
Logs	70,092,320 log feet	283,080	566,155	38
Lumber	1,940,370 feet b. m	6,200	37,800	24
Merchandise		605	45,450	33
Unclassified		2,660	142,600	38
Total		297,555	1,226,705	

Logs and other forest products make up about 97.5 per cent of the total commerce below Marked Tree. Of these about 67.5 per cent are moved in rafts, the balance in barges.

10. The work now carried on under this project consists of operating a snagboat over the river between the mouth and Marked Tree during the late summer and the autumn months. The object sought is to maintain the channel clear of snags and similar obstructions so as to make the full natural depths available for boats. The funds are provided under annual estimates for maintenance. The cost when a full season is worked is approximately $9,000. This does not take in extensive plant renewal, which occurs about every seven or eight years. This averages about $800 a year when distributed over a series of years. By confining the work to the section below Marked Tree one is able to maintain a reasonably clean channel with this expenditure. If one should attempt to maintain even a passable channel at medium and high stages through the Sunken Lands in addition to the work now being done, the annual expense would be doubled, with only about 2½ per cent increase to the tonnage affected. In view of this, it is recommended that the present project for improving St. Francis and L'Anguille Rivers and Blackfish Bayou be modified to provide for maintenance of channel by snagging operations in St. Francis River from its mouth to Marked Tree, in L'Anguille River from its mouth to Marianna, and in Blackfish Bayou from its mouth to the mouth of Fifteenmile Bayou, at an average annual cost of $9,000, with the object of maintaining the channels clear of snags and similar obstructions at the lowest navigable stages.

11. Questions of water-power development, improved terminal and transfer facilities, or allied subjects are not involved in this improvement.

12. Sketch map of the St. Francis River is herewith.

A. B. PUTNAM,
Major, Corps of Engineers.

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[First indorsement.]

OFFICE DIVISION ENGINEER, WESTERN DIVISION,
St. Louis, Mo., May 22, 1915.

The CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. Forwarded.

2. Concurring in the recommendation of the district officer that the improvement of these rivers be confined to snagging at an estimated total annual cost of $9,000.

C. McD. TOWNSEND,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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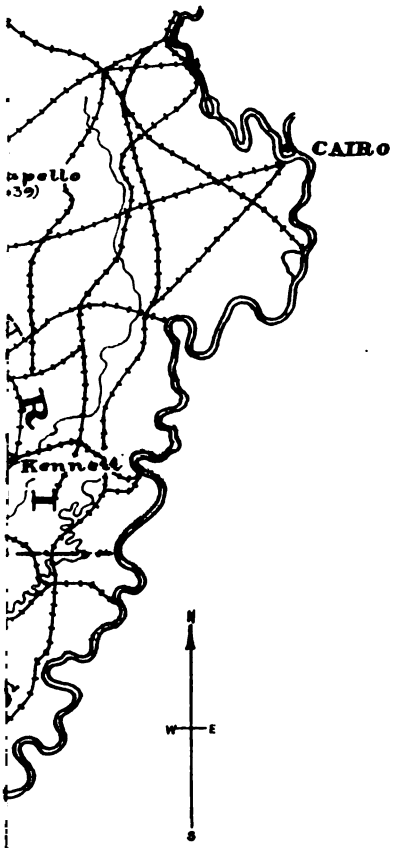
CORPS OF ENGINEERS U.S.ARMY



MEMPHIS

SKETCH

FRANCIS RIVER.

SCALE OF MILES

0 5 10 20 30 40 50

pany report to Chief of Engineers,
d May 12, 1916, on revision of pro-
f Francis and L'Anguille Rivers
Fish Bayou, Ark.

Major, Corps of Engineers, U.S.A.

House Doc. No. 60 ; 64th Cong., 1st Sess.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 61.

PATAPSCO RIVER, MD.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF PATAPSCO RIVER, MD., FROM SPRING GARDEN CHANNEL SOUTHWESTERLY TO ELKRIDGE LANDING.

DECEMBER 7, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 7, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated 29th ultimo, together with copy of a report from Col. Lansing H. Beach, Corps of Engineers, dated July 28, 1915, with map, on preliminary examination of Patapsco River, Md., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, November 29, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Patapsco River, Md.

1. There is submitted herewith for transmission to Congress report dated July 28, 1915, with map, by Col. Lansing H. Beach, Corps of Engineers, on preliminary examination authorized by the river and harbor act approved March 4, 1915, of Patapsco River, Md., from Spring Garden Channel southwesterly to Elkridge Landing.

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2. The Patapsco River rises in Carroll County, Md., and, flowing southeasterly for about 65 miles, empties into Chesapeake Bay 11 miles below the city of Baltimore. From Spring Garden Channel to Elkridge Landing, a distance of about 7 miles, the stream is crossed by a number of fixed bridges. In the lower 2¾ miles the available depth is about 6 feet, shoaling to about 1 foot above this section. Improvement of the river is desired with a view to affording additional deep-water frontage available for the establishment of industrial plants. The district engineer officer states that there is no commerce whatever on the stream at present, but advocates of the improvement believe that an important movement of freight would follow the creation of an industrial harbor. It appears that of the 25 miles of water front on the Patapsco River from Sparrows Point to Curtis Bay, only 9 miles are at present improved. When the larger part of this water front has been occupied, the district officer believes that it may be time to take up the question of the development of the section of river now under consideration, with proper cooperation of local interests. He is of opinion, however, that the locality is not worthy of improvement by the United States at the present time. The division engineer concurs in this opinion.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated September 15, 1915, concurring in the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Patapsco River, Md., from Spring Garden Channel southwesterly to Elkridge Landing, is not deemed advisable at the present time.

DAN C. KINGMAN,
Chief of Engineers, U. S. Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 15, 1915.

The CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's report on Patapsco River, Md., from Spring Garden Channel southwesterly to Elkridge Landing, called for by the act of March 4, 1915.

2. The Patapsco river is a tributary of Chesapeake Bay, which it enters 11 miles below the city of Baltimore. Spring Garden Channel is a part of the harbor of Baltimore. The distance from Spring Garden Channel to Elkridge Landing is about 7 miles. On this section the stream is crossed by a number of bridges with fixed spans. In the lower 2¾ miles the available depth is about 6 feet, while above this reach the depth decreases to 1 foot.

3. In the early history of this part of the country there was considerable commerce handled in a primitive way on small boats, but

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due to changed conditions, both physical and commercial, this disappeared and there is no commerce at all at present.

4. It appears that the improvement is desired principally in connection with the general development of the adjacent area as a part of Baltimore Harbor. While such an improvement would. no doubt, enhance the value of surrounding property and would in time result in a commerce of considerable size, its cost would be very large. Moreover, there are still extensive areas of unused frontage on Baltimore Harbor now available for development without great expense. The district officer therefore expresses the opinion that the locality is not at present worthy of improvement. The division engineer concurs in this view.

5. Parties in interest have been informed of the district officer's unfavorable report and given an opportunity of submitting statements and arguments to the board, but no communications on the subject have been received.

6. In view of the absence of any existing commerce, the impracticability of any effective improvement, except at a very considerable cost, and the lack of any evidence of pressing need for such an improvement at present, the board concurs in the views of the district officer and the division engineer, and reports that, in its opinion, it is not advisable for the United States to undertake the improvement of Patapsco River from Spring Garden Channel to Elkridge Landing at this time.

7. In compliance with law the board reports that there are no questions of terminal facilities, water power, or other related subjects which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

For the board:

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

PRELIMINARY EXAMINATION OF PATAPSCO RIVER, MD.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Baltimore, Md., July 28, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Preliminary examination of Patapsco River, Md., from Spring Garden Channel southwesterly to Elkridge Landing.

1. I have to submit the following report concerning a preliminary examination of Patapsco River, Md., from Spring Garden Channel southwesterly to Elkridge Landing, as called for by the river and harbor act of March 4, 1915, and as directed by letter from the Chief of Engineers of March 15, 1915.

2. The Patapsco River rises in Carroll County, Md., and flowing southeasterly for about 65 miles empties into Chesapeake Bay, 11 miles below the city of Baltimore. The portion from Baltimore to Chesapeake Bay is very different in character from the river above,

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being a tidal estuary or arm of Chesapeake Bay, splitting at Baltimore into three arms, the northwest branch, or inner basin, which has been completely developed, and was until recently regarded as the harbor of Baltimore; the middle branch, or Spring Garden Channel, which is now increasing in use and importance, is a part of the harbor of Baltimore, although not yet generally developed, but its advantages are fast becoming recognized. The third, or southerly, arm is the Patapsco River, its source being some 54 miles above the Spring Garden Channel of Baltimore Harbor.

3. This arm was formerly a tidal estuary of considerable natural depth, like the northern and middle arms, for a distance of 5 or 6 miles, and wide enough to permit sailing vessels to beat their way for more than half the distance from Spring Garden channel to Elkridge, but the great flood of 1868 in the Patapsco brought down such a mass of débris and material that its depth was very materially diminished, and the tidal portion of this arm has since consisted of a narrow channel bordered by marshy flats. Before this flood occurred there was considerable navigation upon it as far as Elkridge, about opposite Relay, a little more than 7 miles from the middle, or Spring Garden, channel of Baltimore Harbor. This navigation reached its maximum before the city of Baltimore had developed to the large port which it now is, and prior to the general introduction of steamboats, when much of the commerce of the country was carried on in small boats, and very largely in sailing craft. Rolling Road, coming to Relay from the north, received its name from the fact that it was a very important artery for the shipment of tobacco, the tobacco being placed in hogsheads which had an iron pipe run axially. An iron rod being placed through this pipe, the hogshead was then rolled along the road by teams and brought to water at Relay or Elkridge Landing and then shipped. There was, and still is standing at Relay, a flour mill deriving its power from a small dam across the river at that point. This mill did considerable business when flour was produced in the East, but since the manufacture of flour has largely drifted to the West and been confined to mills of large capacity, it has ceased to produce flour in sufficient quantities to be regarded as an important item of commerce of the locality. Important iron mills also existed at Elkridge, deriving their supply of ore from mines in the vicinity. These have, however, not been operated for many years, and this office has been informed that the character of the ore was not so well adapted to modern smelting methods that there could be an expectation of the iron mines being worked at present.

4. A reconnoissance of the stream shows conditions at present to be as follows: From the Spring Garden Channel to the Washington, Baltimore & Annapolis Electric Railway bridge, a distance of about 2¾ miles, there is about 6 feet of water in the channel. From the Washington, Baltimore & Annapolis Electric Railway bridge the river shoals rapidly, there being but 1 foot of water about a mile above the bridge. The width of river, 1,400 feet above the Baltimore & Ohio Railroad bridge, is 250 feet; at the Washington, Baltimore & Annapolis Electric Railway bridge it is 195 feet; and at the highway bridge, just above the electric railway bridge, it is 145 feet. The rise and fall of tide is about 15 inches. The stream is now crossed by several bridges. These are in order from the mouth (1) Baltimore & Ohio Railroad bridge, a little more than one-half mile above Spring Garden; (2)

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Baltimore & Annapolis Short Line Electric Railway bridge; and (3) the Washington, Baltimore & Annapolis Line Electric Railway bridge, in close proximity to each other, nearly 2½ miles farther up the stream; (4) a highway bridge, probably one-eighth mile above these two; (5) another highway bridge a little less than 2 miles farther up; and (6) the Pennsylvania Railroad bridge about a mile below Elkridge Landing. None of these bridges have openings in them. Another bridge is now under construction by the State Roads Commission of Maryland across the stream practically at its mouth. It will be a concrete fixed bridge, but with a clearance of about 8 feet, similar to that under the Baltimore & Ohio Railroad bridge. The permit from the Secretary of War authorizing construction requires that an opening be placed in the bridge should the demands of navigation at any time require it. The Baltimore & Ohio Railroad bridge was originally built with a swing span, but after having remained unopened for several years, was changed, by authority of the Secretary of War, to a fixed bridge, upon condition that should conditions require such action the swing span would be restored.

5. The only places upon the banks of the stream possessing sufficient importance to be named are Brooklyn, at the point where this branch empties into the Spring Garden Channel, and Elkridge, at the upper end of the section under consideration. Brooklyn is connected with Baltimore by electric line. Elkridge is connected with Baltimore by the Baltimore & Ohio Railroad running through the place. There are several suburban subdivisions at other points a little distance from the stream; the subdivisions of Pumphrey, Linthicum, and Shipley being upon the south side of the river on the line of the two electric railways at distances from the river bank of approximately ¼, 1¼, and 2 miles, respectively. There is no place with a name on the north bank which could in any way be regarded as tributary to the stream, the nearest place being Halethorp, a station on the Pennsylvania Railroad, and connected with Baltimore by electric cars, but having no wagon road to the river. There is a small station named Patapsco on the Pennsylvania Railroad to the south of the stream and about one-half mile therefrom, but it has no direct wagon road to the river.

6. In order to obtain as much information as possible concerning the desirability of the improvement a public hearing was held in the United States engineer office on May 28, 1915. A copy of the statements made at that hearing, and reported stenographically, is appended hereto.[1] As will be seen from a perusal of the statements made at this hearing, the main reasons advanced for the desirability of the improvement were the development of the property adjacent to the stream and the advantages which the waterway would offer as a manufacturing harbor. There were some who seemed to be of opinion that the restoration of the channel would result in the return of commerce to the stream such as existed prior to the flood of 1868. This, however, is very doubtful, since tobacco is no longer raised in this section of the country in sufficiently large quantities to render it the article of commerce it formerly was, nor is it likely that the iron mills or the flour mill could produce a movement of freight sufficiently large to justify the United States in incurring

[1] Not printed.

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the expense of dredging a channel throughout the entire length of the stream from Spring Garden Channel to Elkridge Landing. There were some who believed that the creation of a channel would result in the shipment of fertilizer in and of vegetables out, in the same manner as is now done by auxiliary power boats from Stony Creek and Rock Creek, small tributaries of the Patapsco River near its mouth. A glance at the map, showing the proximity of the waterway in question to the city of Baltimore, would show that while some produce might be shipped by boat it is not possible to expect that all the produce would follow this route, or even a very material portion of it, as the wagon haul is very much shorter than that from either Stony Creek or Rock Creek. There is no commerce whatever on the stream at present, and the advocates of the improvement are unable to make any estimates of what such commerce would be if it were improved as desired. They believe that an important movement of freight would follow the creation of an industrial harbor, but can give no figures as to probable amount.

7. To create a navigable channel in the portion of the river under consideration would require a reconstruction of the seven bridges mentioned to the extent of providing them with swing or lift spans. The Pennsylvania Railroad has furnished this office with a statement as to the cost which would devolve upon that railroad should such a change be required. It estimates the cost at about $80,000 for the present double-track bridge and the cost of operation at about $5,200 a year, without interest charges on the cost of reconstruction.

8. No offer of cooperation has been obtainable. Although the abutting property owners appear anxious for the improvement, none have offered in any way to share in the expense of creating the channel. An illustration of the benefit to the property is stated by Mr. S. Linthicum on page 8 of the hearing.

9. While there is no doubt concerning the fact that the dredging of a navigable channel at least 25 feet deep throughout this portion of the stream, as desired by the property owners, and the disposition of the spoil upon the flats adjacent would create excellent factory sites on the lower half of the portion of the river considered, and might produce considerable commerce, it is believed that the cost involved is excessive, under present conditions, for the benefits which would be produced, especially when it is realized that of the 25 miles of waterfront on the Patapsco River from Sparrow Point to Curtis Bay only 9 are at this date improved, there being 16 still available for harbor development. When Baltimore has grown so as to occupy the larger portion of this space, it may be time to take up the question of the development of the South Branch of the Patapsco under proper cooperation by the abutting property owners. This time, however, has not yet arrived, and recommendation must be made that the locality is not at present worthy of improvement by the United States.

10. There are no questions of water-power development or flood protection connected with the work proposed. The question of land reclamation enters very largely, it being proposed to deposit the spoil formed by dredging the channel on the half-submerged lands, so as to render them available for building sites.

LANSING H. BEACH,
Colonel, Corps of Engineers.

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[First indorsement.]

OFFICE OF DIVISION ENGINEER, EASTERN DIVISION,
New York City, July 29, 1915.

The CHIEF OF ENGINEERS:

Concurring in the views and recommendation of the district engineer officer.

W. M. BLACK,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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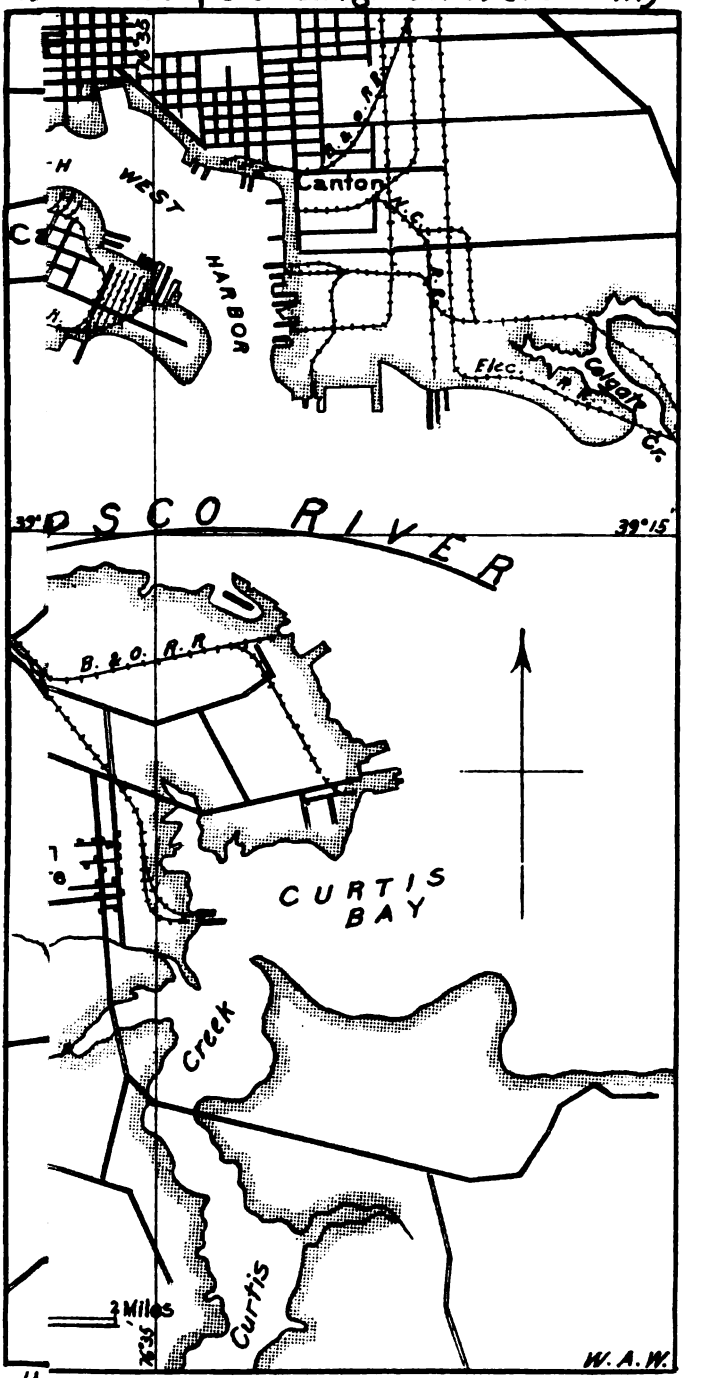
W Corps of Engineers, U.S. Army



U.S. From U.S. G. Survey Chart.

on House Doc. No. 61 ; 64th Cong., 1st Sess.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 369.

HARBOR AT PORT HENRY, N. Y.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORTS ON PRELIMINARY EXAMINATION AND SURVEY OF HARBOR AT PORT HENRY, N. Y.

DECEMBER 14, 1915.—Referred to the Committee on Rivers and Harbors and ordered be to printed, with illustration.

WAR DEPARTMENT,
Washington, December 10, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated 6th instant, together with copies of reports from Col. W. M. Black, Corps of Engineers, dated April 16, 1913, and July 26, 1915, with map, on preliminary examination and survey, respectively, of harbor at Port Henry, N. Y., made by him in compliance with the provisions of the river and harbor act approved June 25, 1910.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 6, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination and survey of harbor at Port Henry, N. Y.

1. There are submitted herewith for transmission to Congress reports dated April 16, 1913, and July 26, 1915, with map, by Col

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W. M. Black, Corps of Engineers, on preliminary examination and survey, respectively, authorized by the river and harbor act approved June 25, 1910, of harbor at Port Henry, N. Y.

2. Port Henry is located on the southwest shore of Lake Champlain, 2 miles northwest of Crown Point. It is the distributing point of the Port Henry iron ore district, the principal mines being at Mineville, about 6 miles back from the lake shore and connected with Port Henry by rail. The annual shipments of ore during the past three years have averaged about 800,000 tons, and the receipts, chiefly coal and merchandise, have averaged from 125,000 to 170,000 tons. Only about 5 per cent of this commerce is now handled by water, on account of the small depth of Lake Champlain Canal, but the enlargement of this canal to a depth of 12 feet is approaching completion. To assist in the development of the port the State of New York has adopted a project for the construction of a modern terminal at considerable cost. The present depth of water along the wharves is from 5 to 6 feet at low lake level, gradually increasing to the eastward. The district officer, who is also the division engineer, believes that the harbor should be given a depth sufficient to permit its use by boats of the maximum dimensions which the canals admit. He submits a project providing ultimately for the dredging of a strip 1,000 feet wide, covering an area of about 50 acres, to a depth of 12 feet at low lake level, and protecting this area by a breakwater, at a total estimated cost of $385,500. Pending the development of a commensurate commerce, however, he proposes to limit the improvement to the dredging of a strip 500 feet wide, covering an area of about 40 acres, at a total estimated cost of $81,500, of which local interests offer to pay $10,000.

3. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated September 28, 1915, concurring with the views of the district officer regarding the advisability of undertaking the lesser project submitted by him.

4. After due consideration of the above-mentioned reports I concur in general with the views of the district officer and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of harbor at Port Henry, N. Y., is deemed advisable to the extent of dredging a strip 500 feet in width and 12 feet deep at low lake level, covering an area of about 40 acres, and indicated by the letters A, B, C, D, E, and F on the accompanying map, at a total estimated cost of $81,500, provided that no work shall be undertaken until local interests have contributed $10,000 toward the cost of the work. The total amount to be paid by the United States, $71,500, should be provided in one appropriation.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

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REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS ON SURVEY.

[Second indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 28, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. The following is submitted in review of the district officer's reports on preliminary examination and survey of harbor at Port Henry, N. Y., authorized by the act of June 25, 1910.

2. Port Henry is located on the southwest shore of Lake Champlain. The harbor is well protected from other directions, but it is exposed to northerly and northeasterly winds which occasionally create seas of sufficient size to render it difficult for boats to lie at the wharves. A small stream known as Mill Brook empties into the harbor. The present depth along the water front is from 5 to 6 feet, increasing to 12 feet at distances of 500 to 1,000 feet or more from shore.

3. The tributary population is about 10,000. The principal industry is the production of iron ore from the rich mines 6 miles distant, the annual shipments amounting to about 800,000 tons. The receipts, chiefly coal and merchandise, average from 125,000 to 170,000 tons. At present only about 5 per cent of this commerce is handled by water, owing to a lack of adequate navigation facilities in the old Champlain Canal. It is expected that the enlarged canal, with depth of 12 feet, will be completed in 1916. It is estimated that with suitable facilities about 750,000 tons may reasonably be expected to be handled by water, resulting in a material reduction in the cost of transportation.

4. In connection with its canal system, the State of New York is building a water terminal at Port Henry, at a cost of about $100,000. It extends from the shore into the lake about 500 feet. In addition to the construction of the pier terminal, the State is to dredge a basin on the south side of the pier, 600 feet wide and 12 feet deep, extending eastwardly to deep water, and divert the mouth of Mill Brook from the south to the north of the pier, in order to prevent further deposit in the harbor from that stream. Local interests desire that the United States dredge a suitable area along the wharves and adjacent to the new terminal to permit the use of vessels of the maximum draft, which will ply on the canals, and they agree to contribute $10,000 toward the execution of this work.

5. The district officer presents a plan of improvement which provides ultimately, in case of a sufficient development of commerce, for the dredging of a strip 1,000 feet wide, covering an area of about 50 acres, to a depth of 12 feet at low lake level and protecting this area by a breakwater, at a total estimated cost of $385,500. But for the present, it is proposed to limit the work to dredging a strip 500 feet wide, covering an area of about 40 acres. This work is estimated to cost $81,500, of which local interests offer to pay $10,000. It is believed that the work will be practically permanent, so that only very occasional maintenance operations will be required. The district officer, who is also the division engineer, believes the locality is worthy of improvement, and he recommends under certain provisions of local cooperation, the immediate execution of the

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lesser project, and if commerce demands, the ultimate adoption of the larger project.

6. During its consideration of this subject, a committee of the board visited the locality, conferred with the parties in interest, and inspected the harbor, the iron mines, and the Champlain Canal. If the State canals are to meet with the success hoped for, the harbor of Port Henry should be an important factor in the development of commerce on the Champlain Branch. The latter is now nearing completion, and in anticipation of this event, the State is doing its part in the development of a modern terminal at considerable cost. It is found that some dredging, in addition to that contemplated by the State and by local interests, is necessary to afford a suitable depth in the harbor for the class of vessels expected to use it. This is the work asked of the United States. The cost of doing this work to the extent necessary to meet present and immediately prospective needs of commerce is represented by the smaller project proposed by the district officer, and is less than the State is to expend on its terminal.

The board concurs with the district officer in the opinion that commensurate benefits would result from the lesser project proposed by him, and believes that this will be ample to meet the present and immediately prospective needs of commerce at this locality. The question of additional work should be determined when experience has shown that the facilities now proposed are inadequate.

7. In view of the foregoing, the board recommends the dredging by the United States to a depth of 12 feet at low lake level of the area, A, B, C, D, E, F, as shown on the map, at an estimated cost of $81,500, provided that no work shall be done by the United States until local interests shall have contributed $10,000 of this amount, to be used by the United States in the prosecution of the work. The total amount to be appropriated by the United States, $71,500, should be appropriated in one sum.

8. In compliance with law, the board reports that except as contemplated by the above recommendations, there are no questions of terminal facilities, water power, or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

For the Board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

PRELIMINARY EXAMINATION OF HARBOR AT PORT HENRY, N. Y.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
First District, New York City, April 16, 1913.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Preliminary examination of harbor at Port Henry, N. Y.

1. The preliminary examination of this harbor was required by the river and harbor act approved June 25, 1910. A personal inspection of the harbor was made by Capt. R. D. Black, Corps of Engineers, in

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company with Mr. J. H. Rostock, assistant engineer, on May 1, 1911. I visited the harbor personally on September 24, 1912.

2. Under date of June 12, 1911, a preliminary report[1] was submitted in which it appeared that the State of New York had under contemplation the establishment of extensive terminal facilities at Port Henry in connection with the work of enlarging the State canals, and that the question of the advisability of the United States doing any work in this harbor was dependent upon the work to be done by the State, which had not been definitely decided upon. Under these conditions the report was returned to this office by indorsement dated June 22, 1911, with directions to report further when definite action had been taken by the State.

3. The harbor at Port Henry, N. Y., is located on the west side of the south end of Lake Champlain, about 2 miles northwest from the head of the "Narrows" at Crown Point. The harbor is nothing more than an irregular stretch of lake shore extending about 2 miles north from the entrance to Bulwagga Bay. The lake at this point being only about 2 miles wide, no difficulty is experienced from gales from the east, south, or west, but the harbor is entirely exposed to the full force of northerly and northeasterly winds, which are frequently of such severity as to render it impossible for vessels to lie at the wharves and dangerous for them to anchor. Water shoaler than 12 feet extends from the shore line for a distance of from 500 to 1,000 feet out into the lake. With the exception of a single steamboat landing at the extremity of a point extending about 200 feet out from the general shore line just north of the mouth of a small creek near the northern limit of the harbor, all of the wharves now in regular use are of the form of bulkhead piers extending along the shore. The depth of water at these wharves ranges from 5 to 7 feet at low lake level and at highest lake level is about 9 feet more. The average depth during the season of navigation is probably from 2 to 3 feet more than at low lake level. The harbor has a good bottom for anchorage.

4. The need for protection from the northerly gales resulted in preliminary examinations ordered by the acts of Congress passed March 29, 1875, March 3, 1881, and August 2, 1882. In connection with these examinations a tentative project was prepared providing for the construction of a breakwater 3,500 feet long, to be located in a direction at right angles to the main axis of the lake, at a point about 3,000 feet north of the present steamboat landing, with its inner end about 1,000 feet off shore. The average depth of water at the proposed location was 32 feet, and the breakwater was estimated to cost $559,030. Maj. G. L. Gillespie, Corps of Engineers, in reporting upon this project December 20, 1881, says:

> The construction of the breakwater would give a much-needed protection to the industries which center at Port Henry, and as this is the most important point on the west side of the lake, I would recommend that a liberal appropriation be made for the improvement for which an estimate is submitted.

Maj. Walter McFarland, Corps of Engineers, in a report dated February 26, 1883, states:

> I must report that I think the harbor worthy of improvement, but not at so great a cost as that indicated by the * * * estimate.

No appropriations have been made.

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[1] Not printed.

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5. The commercial situation of Port Henry is set forth in the inclosed report[1] of the board of trade, dated May 5, 1911. Port Hen y is the shipping point for the Port Henry iron-ore district and the principal mines are located about 6 miles from Port Henry and are connected with it by a railroad owned by the mining company. The tracks of the Delaware & Hudson Railroad pass along the shore line of the harbor.

6. The output of the mines during the past two years amounted to over 1,000,000 tons per annum. Port Henry is the distributing point for a population of about 10,000. At present at least 90 per cent of the ore tonnage is marketed by rail, due to the lack of transportation facilities by water. Bearing in mind the length of the navigation season and assuming that rail rates on the ore can not be lowered materially, due to the actual cost of rail transportation, it is safe to assume that 75 per cent of the present output, or 750,000 tons, will be shipped by water when suitable facilities are afforded. The following extracts are quoted from a letter received under date of May 5, 1911, from Mr. F. S. Witherbee, president of Witherbee, Sherman & Co., of Port Henry, N. Y.:

* * * Port Henry is the shipping point for what is known in the iron and steel trade as the "Port Henry iron-ore district." * * * The Port Henry ores are the highest in iron contents of any ores mined in this country and are used in variable percentages by nearly every plant east of the Allegheny Mountains and as far east as Nova Scotia, and during periods of depressed business conditions have been exported to Europe. * * * When the new State Barge Canal is completed, as it is expected to be in the spring of 1913, without doubt a large percentage of ore shipments will go forward by water, as is shown by the following rail rate to principal points of consumption now and the estimated rates that will probably be put in effect when the new barge canal is completed, viz:

	All-rail rates.	Estimated barge canal rates.
Port Henry to—		
New York and vicinity	$1.50	$0.50
Bethlehem, Pa.	1.60	1.00
Reading, Pa.	1.70	1.20
Buffalo, N. Y.	1.55	.60

By the above reduced rates a much larger tonnage and a much wider market should prevail for the ores of this district. * * * In addition to its importance as an iron-ore distributing point, Port Henry is a large distributing point for merchandise to the adjacent towns. There are two national banks, a shirt factory, a blast furnace, railroad shops, a large electrical power plant, a flour mill, a gas and electric plant, etc. * * * With the benefits likely to accrue from the barge canal there will be at least an outward tonnage from Port Henry annually of 1,500,000 tons, and an inward tonnage of not less than 150,000 tons, principally coal and coke * * *

7. It is believed that with the completion of the Champlain division of the New York State Barge Canal, the improvement of the narrows of Lake Champlain, recommended in House Document No. 1387, Sixty-second Congress, third session, and with the improvement of the harbor of Port Henry itself, the saving in freight rates by water transportation named in Mr. Witherbee's letter can be had. The farm products of the district are of minor importance, and it is

[1] Not printed.

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not believed that the betterment of facilities for water transportation will affect them to any great extent.

8. Under date of March 11, 1913, an application[1] was received from the terminal engineer of the State of New York, addressed to the Secretary of War, for permission to construct a terminal in the village of Port Henry in the general location shown on the accompanying blue print. Plans and specifications covering the details of the work proposed have also been received. The application referred to will be forwarded, together with recommendation, in a separate communication.[1]

9. The plan adopted for the State terminal provides for a solid pier, with concrete retaining walls, built on stone-filled cribs, and extending 500 feet into the lake from the present steamboat landing. It is designed for the general channel depth of 12 feet adopted for the barge canal. In his letter[1] of March 7, 1913, the terminal engineer of the State of New York suggests that in the interests of navigation and of the public, improvements should be undertaken by the United States to the extent of excavating a suitable harbor to the south and under the protection of the pier to be built by the State, with a depth of water of 12 feet, conforming to barge-canal standards and to the standard depth lately recommended for projects in this vicinity.

10. It now appears that the State has decided definitely to construct a terminal in accordance with the general plans outlined above. This terminal will provide a public dock. It is not known whether it will be equipped with mechanical appliances for handling.

11. It is my opinion that the harbor of Port Henry is worthy of improvement by the United States. The extent and cost of the improvement to be recommended can only be determined after a survey of the harbor has been made. There are no questions of water power to be considered, nor of removal of snags, nor of headroom under bridges, excepting for navigation through the barge canal, over which the bridges afford a clear height of 15½ feet.

12. It is recommended that authority be granted to make a survey and prepare a project and estimate.

W. M. BLACK,
Colonel, Corps of Engineers.

[Second indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
May 19, 1913.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. For reasons stated herein, the board concurs with the district officer, who is also division engineer, in recommending a survey in order to determine the extent and advisability of the improvement.

For the board:

WM. T. ROSSELL,
Colonel, Corps of Engineers,
Senior Member of the Board.

[1] Not printed.

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SURVEY OF HARBOR AT PORT HENRY, N. Y.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
First District, New York City, July 26, 1915.

From: The district engineer officer.
To: The Chief of Engineers, United States Army.
Subject: Report on survey of harbor at Port Henry, N. Y.

1. Complying with the instructions dated May 26, 1913, the following report is submitted on the survey of harbor at Port Henry, N. Y. This report was originally submitted April 16, 1915, but is revised and resubmitted as of this date pursuant to instructions dated July 23, 1915, for the purpose of modifying the project originally submitted so as to include changes in the matter of local cooperation by New York State and local interests of Port Henry, in amplification of their first proposals.

2. *Previous examinations and surveys.*—In 1876 a survey was made and a project submitted by Lieut. Col. Newton, Corps of Engineers. He recommended that the improvement of the harbor take the form of the construction of a breakwater at an estimated cost of $559,030. In 1881 an examination was made under the direction of Maj. G. L. Gillespie, Corps of Engineers, and a report was submitted recommending anew the construction of a breakwater at an estimated cost the same as submitted by Col. Newton. In 1883 a preliminary examination was made under the direction of Maj. Walter McFarland, Corps of Engineers, and an estimate for a breakwater to cost $300,000 was submitted with the statement that the merits of the project did not warrant so great an expenditure and that the work was not considered a public necessity. No project for improvement has been adopted and no appropriations have thus far been made.

The river and harbor act approved June 25, 1910, directed a preliminary examination of harbor at Port Henry. This examination was made by Capt. R. D. Black, Corps of Engineers, and a report submitted May 24, 1911. A supplementary report was submitted by this office April 16, 1913, stating the harbor was worthy of improvement by the United States, the extent and cost of the improvement to be determined by a survey.

3. *Description of the port.*—Port Henry is located on the southwest shore of Lake Champlain 2 miles northwest of Crown Point, at the mouth of the shallow bight known as Bulwagga Bay and opposite the entrance to the Narrows of Lake Champlain. Port Henry, located in Essex County, N. Y., is the distributing point for what is known as the Port Henry iron ore district. The district includes the towns of Port Henry, Cheever, and Mineville. The total population is about 10,000, of which 2,500 are directly engaged in the mining of a rich magnetic iron ore. The principal mines are located at Mineville, about 6 miles back from the lake shore, at an elevation of from 1,000 to 1,500 feet. The mines are connected with the lake shore by the Lake Champlain & Moriah Railroad, owned by the mine companies. This railroad owns and operates the ore docks, and its tracks connect directly with the docks and with the tracks of the Delaware & Hudson Railroad.

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There is no natural harbor at Port Henry, but the word "harbor" as used in this report is applied to the area in front of the existing ore docks and south of the barge canal terminal. The present docks extend for a distance of about a mile along the rocky, precipitous shore of the lake. The wharves are protected by the high hills on the westerly side of the lake and by Crown Point from westerly and southerly gales; no great inconvenience other than a slight choppy sea is experienced from southeasterly winds. They are exposed, however, to northerly and northeasterly winds which create seas having a fetch of more than 10 miles and make it unsafe for present type of canal boats to lie against the wharves during storms.

The lake bottom is composed of heavy mud with some sand and a small amount of sawdust. Twenty-three borings made over the harbor area have developed no rock lying above a plane of −12 feet at low lake level. No gravel has been found. The geographical location is such that with the opening of the new barge canals of the State of New York, the Port Henry district is particularly well situated to participate in the benefits offered by the increased water facilities. The only stream entering the locality proposed for improvement is what is known as Mill Brook. In ordinary times it is an insignificant stream, but it is estimated to bring down annually during freshets about 5,000 cubic yards of silt.

4. *Present commercial facilities of Port Henry.*—A line of bulkhead wharves or ore docks for storing and loading iron ore extends along the Port Henry water front for about a mile. These docks are controlled by the Lake Champlain & Moriah Railroad Co., whose stock is owned jointly by two of the local mining companies. They are maintained in a generally serviceable condition. In the past their use has been permitted to the public at a nominal charge. In 1914 the State of New York began the construction of a public terminal adapted to boats using the improved barge canal. This terminal projects from the shore at a point about 1,500 feet north of the ore docks, and extends into the lake in a southeasterly direction for 500 feet. Up to mean low water it is built of cribs with a width of 75 feet and narrows thence to a width of 50 feet at the elevation of the dock, about 8.5 feet above mean lake level. The northerly face is chamfered and not intended to receive vessels; the east and southerly faces are vertical. Immediately south of the terminal and parallel thereto the State is to dredge a basin 600 feet wide and 12 feet deep, extending eastward to deep water. The estimated cost of the terminal is $100,000; it is about 45 per cent completed and will probably be finished during the present season. It will be equipped with a warehouse and cargo-handling machinery, but on account of provisions in the New York State Barge Canal act it can not be adapted to an economically commercial handling of ore shipments. For other prospective local uses its size and location are ample.

The depth of water along the wharves is from 5 to 6 feet at low lake level. The depth increases to the eastward gradually to the 15-foot contour and thence rapidly. The annual range of Lake Champlain levels is approximately 6 feet. The −12-foot contour is from 500 to 1,000 feet east of the wharf front. The ore docks have a storage capacity of about 250,000 tons. They are equipped with trestles and modern terminal machinery, chiefly locomotive magnet

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cranes, capable of handling a million tons of ore yearly. The Delaware & Hudson Railroad tracks traverse the length of the docks. The ore can be loaded from the docks directly into either boat or car.

5. *Desired facilities and improvements requisite to produce them.*—To develop a water-borne commerce at Port Henry it is necessary that greater depth be secured in the harbor, that some protection against northerly gales be furnished, and that the silting of the harbor by Mill Brook be stopped. The depth of the new State waterways is 12 feet. In order that Port Henry may participate in the benefits of the new water-borne commerce, it is necessary that its harbor be dredged to permit its use by boats of the maximum dimensions which the canals admit. In addition to the ore boats, provision must be made for the passenger and packet steamers now calling at this port. The largest of these steamers is 262 feet long. The absence of rock bottom and of serious obstructions in the harbor and the proximity of deep water combine to make the improvement of this harbor comparatively simple.

6. *Local cooperation.*—The ore industry is conducted by four firms, the Witherbee-Sherman Co., the Port Henry Iron Ore Co., the Cheever Iron Ore Co., and the Northern Iron Co. These firms are understood to be connected with one another. They are very desirous of shipping their freight by water, and are now preparing to build extensive new docks located as shown on the accompanying chart No. 3.[1]

The State of New York, by action of its canal board July 21, 1915, determined to make the diversion of Mill Brook a part of its terminal development project. This will cause the brook to empty into Lake Champlain to the northward of the new barge canal terminal and thus outside the area of improved or dredged harbor.

Local interests have, on July 21, 1915, pledged themselves (see Appendix, p. 23) to contribute $10,000 toward the proposed Government harbor project; the application of this $10,000 offer of cooperation is not limited.

7. *Commerce of Port Henry.*—The commerce of Port Henry is based upon the ore industry. It is estimated that the present investment of the mining interests in the Port Henry district has a physical value of more than 10 millions of dollars. The ore is shipped to various furnaces in the northeastern part of the United States; the principal market is in Pennsylvania. There is also considerable traffic in lumber and in fertilizer made from certain of the ore tailings having a large phosphatic content.

The present rail rate for hauling the ore to Pennsylvania furnaces is approximately $1.60 per ton. The rail rate to New York is $1.80 and to Buffalo, $1.55 per ton. It is estimated that with large boats plying the new canals the water rates to New York will be reduced to 50 cents per ton. The long water haul from Port Henry to New York, supplemented by the short rail haul to Bethlehem and Reading, should result in a transportation saving over the present rates of from 45 to 60 cents per ton. The rail charges to the points mentioned are based upon a rate of one-half cent per ton-mile. It is believed that railroads will hardly be able to reduce materially this rate and make a profit. It appears reasonable to predict with considerable certainty that a very large traffic will be developed by boat.

[1] Not printed.

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The reason for the decline in the present water-borne commerce lies in the lack of capacity of the Champlain Canal. That canal did not share in the full development of the Erie Canal, so that in recent years while boats could load with 250 tons at a 6-foot draft on the Erie branch, the same boats were limited on the Champlain branch to a draft of slightly over 4 feet, carrying loads of but 130 tons. With this insignificant load the boat traffic could not compete with the railroads.

The new Champlain Canal is expected to open for traffic in 1916. Boats will be able to carry a draft of nearly 12 feet and can load as much as 1,500 or 2,000 tons, according to type. It is probable that even in the new conditions not all the ore and coal will move by boat. If as much as one-half the present shipments of ore are carried by boat at an average saving of 50 cents per ton, there will be a saving on 400,000 tons annually of $200,000. The saving upon receipts would be in somewhat less measure. The ore interests predict that with enlarged transportation facilities by water new markets will be open to them, and that their vast ore deposits will be developed to the point of an annual shipment of a million and a half tons of ore. The low class of freight forming the bulk of this tonnage is peculiarly adapted to water-borne carriage. It will be seen, therefore, that without considering prospective commerce the saving on present commerce that can reasonably be predicted to follow adequate improvements will be sufficiently large to justify a considerable expenditure.

The annual shipments of ore during the past three years have averaged about 800,000 tons. The receipts, chiefly coal and merchandise, have averaged from 125,000 to 170,000 tons. Both shipments and receipts during the past have shown a steady annual increase. In 1875 the water-borne commerce at Port Henry amounted to approximately 300,000 tons per year. At the present time the water-borne commerce has dwindled to approximately 5 per cent of the total tonnage.

8. *Scope of project.*—The ore interests state (see appendix, p. 18) that the transportation by water of a million tons of ore annually will require an anchorage harbor for a fleet of approximately 30 boats of about 250 feet length each. Such a fleet added to the boats now calling at Port Henry would require a harbor of not less than 50 acres.

A harbor 1,000 feet wide and 12 feet deep at low lake level, extending from the —12-foot contour opposite the present ore docks running thence northerly nearly parallel to the face of the new ore docks and distant about 50 feet therefrom to connect with the dredging to be done by the State south of the Barge Canal terminal, will involve the removal of approximately 500,000 cubic yards of soft material, including one foot overdepth. This material could be moved most economically by a hydraulic dredge. It could be spoiled into deep water to the eastward without risk of its being carried back into the dredged area at a distance of 3,000 feet; or, it could be used to make a mound to the eastward of the harbor which would also be a partial protection for the harbor from southeasterly storms and along which a breakwater could be built later if desirable. There are also two available spoil areas on the shore,

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namely, the filling of the new proposed ore dock, as shown on sheet 3,[1] and the area between the new ore dock, Mill Brook and the Delaware & Hudson tracks. East of the Delaware & Hudson Railroad and west of the proposed front line of the new ore dock, about 275,000 cubic yards of spoil can be placed to elevation 104, the elevation of the railroad; provided the Port Henry sewer be extended to the lake and provided that a slag or other wall be built to retain the material.

In this area the State is expected to spoil about 65,000 cubic yards from the dredging south of the terminal and to diminish to that extent the dredging of the harbor by the United States. The ore interests are expected to spoil into the same area about 20,000 cubic yards dredged from between their docks and the area dredged by the United States. Space will thus remain to hold about 190,000 cubic yards of material dredged by the United States, leaving about 310,000 cubic yards to be otherwise disposed of, preferably into deep water.

Disposal into any of these areas will be a simple matter. There will be practically no elevation to overcome and the United States will not be put to expense for any of the disposal areas mentioned as they are owned by the ore companies. The cost of dredging 500,000 cubic yards at 20 cents per yard is $100,000. Such dredging would provide a harbor of nearly 50 acres in area. This area is believed to be sufficient to accommodate any future developments at Port Henry reasonably to be expected.

A harbor 500 feet wide, 12 feet deep, and extending from the −12-foot contour opposite the present ore docks running thence nearly parallel to the dock front north to the dredged area south of the Barge Canal terminal would involve the dredging of 350,000 cubic yards, including 1 foot overdepth. This dredging would provide a harbor nearly 40 acres in extent and at 21 cents per cubic yard, the dredging would cost $73,500. The disposal would be made in the same shore areas as indicated above and about 160,000 cubic yards in deep water in the lake. The harbor would be sufficiently large to accommodate easily the traffic to be anticipated for several years to come. Later, after the water-borne commerce shall have developed, the balance of the 1,000-foot harbor could be dredged.

For the maintenance of any dredging in the harbor it is necessary to prevent further silting of the improved area by Mill Brook. The diversion of this stream so as to cause it to empty outside the area proposed for improvement has already been provided for by the State of New York.

Protection for the new type of barge canal boat while lying at the new ore docks will be afforded by the breakwater formed by the canal terminal to the northward. Vessels lying away from the wharves will be further protected somewhat by the ridge of material which will remain along the east edge of the 500-foot cut after dredging. This ridge, whose crest will be about 7 feet below low lake level, will have a tendency to break up waves rolling in from the lake.

It is believed that if a large local commerce does result from the improvement of the New York waterways, necessitating the extension of the harbor to the maximum dimensions of 1,000 feet width as above described, additional protection for that commerce will be needed

[1] Not printed.

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against the northerly and northeasterly gales for boats at anchor in the roadstead as well as for those loading at the docks.

Additional protection on the east can be secured later by spoiling the dredged material from the second or outer part of the 1,000-foot cut so as to form a mound whose top will be kept some 7 feet below low lake level. This mound would serve as the base of a breakwater. The mound would be placed sufficiently far to the east to insure against any of its material going back into the dredged area. The lake is virtually devoid of strong currents and the movement of the material constituting such a mound would be entirely the result of wave action. Wave action at the depth mentioned would not be great. If experience demonstrates the necessity of retaining the dredged material, such retaining wall could be built of slag, of which there is a great quantity in the furnace dumps on shore. The slag would also be available as a core for a breakwater. In the outer harbor dredging there remains 150,000 cubic yards of material which is sufficient to make a base for the needed breakwater.

A breakwater can be built either by extending the present State terminal as a breakwater or by building the above-described mound to the eastward of the harbor or by both methods. For the complete protection of a large local commerce a breakwater will need to be approximately 2,500 feet in length. Destructive wave action continues past the end of a breakwater on an angle of about 45° beyond its original direction. A breakwater to afford good protection along the docks as far south as the pier east of the Delaware & Hudson Railroad station can not be constructed less than approximately 2,500 feet in length. A breakwater to afford complete protection as thus outlined will probably not be undertaken unless commerce develops to an extent demanding the dredging of the outer cut of the harbor, in which case the dredged material will be available for the base of the breakwater. The exact limits of the breakwater and the size and location of navigable opening or gap at the northern limit of the harbor can best be determined after an increased water-borne trade has demonstrated its needs.

Until the increased commerce actually develops, however, as a result of the improvements at Port Henry harbor and the canal improvement of the State, it is believed wise not to expend the large amount of money which the construction of a breakwater would entail. At two other Lake Champlain ports, Swanton and Gordons Landing, breakwaters were commenced in advance of the commerce they were designed to protect. The forecast for an increased water trade was present in each instance, but, nevertheless, that trade did not actually develop. Work on the breakwaters was abandoned before completion of the structures and adequate return has not been received on the investment.

It is believed wise, therefore, to defer the construction of the breakwater until the growth of commerce shall warrant it and to limit the initial improvement to dredging; the spoil of the dredging to be disposed of in deep water to the northeastward, at a distance where it can not return to the dredged area.

In requesting permit for the construction of new ore docks, the ore interests have bound themselves to permit the use of their new docks at uniform charges to common carriers for any traffic. These ore

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interests have never engaged in the water transportation trade and state that they are desirous of refraining from entering the water transportation business, if lake and canal carriers will properly transport the ore. The benefits to be anticipated as a result of the contemplated improvements will extend to the local ore interests, to all lake carriers, to the coal trade, to the local shippers and their consumers, to the iron trade of northeastern United States, and through the latter to the iron consumers at large.

9. *Maintenance.*—Due to absence of strong currents in the lake and to the proposed diversion of Mill Brook outside the dredged area, it is believed that the improvement will be practically permanent. No estimate, therefore, for annual maintenance is submitted.

10. *Estimates.*—The total estimate for the ultimate improvement at Port Henry is as follows:

500,000 cubic yards dredging, at 20 cents per cubic yard	$100,000
2,500 linear feet breakwater, at $100 per foot	250,000
Removal of obstructions	500
Engineering and contingencies	35,000
	385,500
Subtract amount contributed locally	10,000
Aggregate	375,500

The estimate of the cost of the work believed to be immediately necessary is:

Dredging	$73,500
Removal of obstructions	500
Engineering and contingencies	7,500
	81,500
Subtract amount to be contributed locally	10,000
Aggregate	71,500

11. *Recommendations.*—The harbor at Port Henry is believed worthy of improvement. It is recommended that the following project be adopted:

First. For immediate execution to secure a depth of 12 feet at low lake level by dredging in an area bounded approximately by the lines ABC, CD, and DEF, giving an area in connection with the State dredging of approximately 3,000 feet by 500 feet, and for removal of minor obstructions, at an estimated cost of $71,500, provided that no work shall be done until an agreement satisfactory to the Secretary of War shall have been concluded between the United States and the local interests by which the sum of $10,000 shall be contributed as local cooperation in helping to defray the cost of the work to the United States; and provided further, that if required the United States shall be furnished by local interests, free of charge, slag for use in protection works in an amount not exceeding 50,000 cubic yards.

Second. For final execution when the works are warranted by increase of commerce, the deepening to 12 feet at low lake level of the additional area bounded approximately by the lines FED and DGH, thereby increasing the width of the harbor to approximately 1,000 feet; and the construction of a breakwater approximately 2,500 feet long on lines to be determined by the necessities of commerce; the estimated aggregate cost of the entire project to be $375,500.

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There are no questions of water power, terminal facilities, or other related subjects, except those above mentioned, that could be advantageously coordinated with the improvement proposed to lessen its cost and compensate the United States.

The survey was made by Mr. L. G. Fitzherbert, surveyor. Extracts from report of Mr. A. C. Harper, assistant engineer, on the survey, and copies of letters from interested parties are herewith.

W. M. BLACK,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors on Survey see p. 3.]

EXTRACTS FROM REPORT OF ASSISTANT ENGINEER A. C HARPER ON SURVEY OF PORT HENRY HARBOR, N. Y.

Datum.—All soundings and shore elevations are referred to a plane of low lake level established prior to 1871, and still in use by the United States Engineers; and which is 92.5 feet above mean sea level at Sandy Hook, N. J. (For a description of this plane and an exposition of the reasons which lead to its establishment and adoption see pp. 7-9, H. Doc. No. 759, 61st Cong., 2d sess.)

Physical characteristics.—A small stream (Mill Brook) empties into the lake in this locality and the deposits from it have formed a bar extending from the steamboat dock, Ref. 100 E. and 200 S. in the vicinity of Witherbee-Sherman & Co.'s power house, Ref. 0, southward about 2,300 feet and lakeward about 1,600 feet, at its greatest width. The material composing the bar is loam mixed with a small percentage of sand. No rock was found to a depth of 12 feet.

Lake levels vary, generally, between elevation 92.5 during the months of November and December and elevation 100 during the months of March, April, and May. The rise from the low to the high level stage usually occurs in the month of March, and is very abrupt, while the fall from the high to the low level stage, except during the months of April and May, is quite gradual. The average annual range of lake level is about 6 feet and the extreme range is between 9 and 10 feet.

There is little or no current in the lake in this vicinity except during a time of protracted storm.

For complete meteorological data see page 26, H. Doc. No. 1387, Sixty-second Congress, third session.

Obstructions.—There are no bridges within the harbor limits; the only artificial obstruction in the way of navigation or of proposed improvement being a mooring post set into a stone filled crib, and its removal can be cheaply effected, if necessary.

COMMERCIAL SITUATION.

Manufactures.—The manufactures of Port Henry are pig iron, lumber, fertilizer, and shirts, all of which, except a portion of the lumber, seek a distant market, and consumers should be benefited by any noticeable reduction in transportation costs.

Statistics.—The character, amount, and value of freight shipped to and from Port Henry during the year 1913 were as follows: The figures have been taken from the report of the local board of trade:

Item.	Amount (short tons).	Value.
General merchandise	27,000	$270,000
Iron ore	736,500	2,209,500
Coal	45,230	185,443
Coke and limestone	101,083	202,166
Pig iron	67,721	1,015,815
Total	977,534	3,882,924

Of the above about 95 per cent was shipped by rail and about 5 per cent by water.

As shown by the foregoing, about 98 per cent of the material forming the commerce is of a bulky character, and as such is particularly adapted to water transportation.

(For a description of the Port Henry iron ore district and its commercial situation see p. 17, H. Doc. No. 1387, 62d Cong., 3d sess.)

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POSSIBLE SAVING IN FREIGHT RATES ON THE BASIS OF EXISTING COMMERCE.

A comparative study of existing freight rates on the present State canal and of those expected from the new barge canal with its 12-foot depth of channel was made in this office in connection with the report on the survey of the Narrows of Lake Champlain, and the results are published in H. Doc. No. 1387, page 36. These results have been supplemented for the purpose of this report by personal interviews and correspondence with shippers. With this information as a basis, it is estimated that by deepening the harbor of Port Henry to 12 feet savings in amounts approximating those shown in the following table would accrue annually on the present commerce of that port, and the inhabitants of the locality and the consumers of its products at large should be correspondingly benefited.

TABLE OF ESTIMATED ANNUAL SAVINGS AND JUSTIFIABLE EXPENDITURES.

(Based upon the commerce of 1913.)

Shipping points.	Rate, all rail.	Estimated barge canal rate.	Estimated saving by water per ton.	Amount now shipped	Total estimated saving.	Justified investment at 4 per cent.
IRON ORE.				*Tons.*		
Port Henry to New York Harbor and vicinity	$1.80	$0.50	$1.30	245,500	$319,150.00	$7,978,750.00
Port Henry to Bethlehem, Pa.	1.60	1.00	.60	122,750	73,650.00	1,841,250.00
Port Henry to Reading, Pa.	1.65	1.20	.45	122,750	55,237.50	1,380,937.50
Port Henry to Buffalo, N. Y.	1.55	.60	.95	245,500	233,225.00	5,830,625.00
Total				736,500	681,262.50	17,031,562.50
COAL.						
Clearfield district, Pennsylvania, to Port Henry	2.75	2.05	.70	45,230	31,661.00	791,525.00
GENERAL MERCHANDISE.						
New York City and vicinity to Port Henry	6.00	3.75	2.25	27,000	60,750.00	1,518,750.00
COKE.						
Clearfield district, Pennsylvania, to Port Henry	2.40	1.80	.60	61,083	36,649.80	916,245.00
PIG IRON.						
Port Henry to Pittsburgh, Pa., and vicinity	2.85	2.15	.70	67,721	47,404.70	1,185,117.50
LIMESTONE.						
Lake Shore points to Port Henry		.25		40,000		
Grand total				977,534	857,728.00	21,443,200.00

While the estimate of savings in the foregoing table was made by persons having knowledge of transportation, it is based upon arbitrary assumptions, and it is possible that the figures may be excessive in that it may not allow for the cost of extra handling of certain commodities at water terminals, as compared with direct rail shipment, and it may also include savings upon freight which will be carried by rail. For these reasons the estimate may not be sufficiently accurate to govern the expenditure of public funds.

APPENDIX.

LETTER OF THE PORT HENRY BOARD OF TRADE.

PORT HENRY, N. Y.,
January 2, 1914.

SIR: The village of Port Henry is located on Lake Champlain about 40 miles north of Whitehall and by internal water communication about 250 miles north of New York City.

Port Henry is the shipping point for what is known in the iron and steel trade as the "Port Henry iron-ore district." The principal mines are located at Mineville,

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about 6 miles from Port Henry, and connected with Port Henry by the Lake Champlain & Moriah Railroad, a standard-gauge railroad with the most modern and up-to-date roadbed and equipment.

The Port Henry ores are the highest in iron contents of any ores mined in this country, and are used in variable percentages by nearly every plant east of the Allegheny Mountains and as far east as Nova Scotia; and during periods of depressed business conditions have been exported to Europe.

Up to about ten years ago the largest percentage of ore shipments were made by water, but owing to an insufficient depth of water in the present Champlain Canal, and the fact that it is so soon to be abandoned that no new boats have been built, and those formerly in service having worn out, shipments by water have so dwindled that in 1913 the proportion was 95½ per cent by rail and 4½ per cent by water.

When the new State barge canal is completed, as it is expected to be in the spring of 1916, without doubt a large percentage of ore shipments will go forward by water, as is shown by the following rail rates to principal points of consumption now, and the estimated rates that will probably be put in effect when the new barge canal is completed, viz:

	All rail.	Estimated barge-canal rates.
Port Henry to New York Harbor and vicinity	$1.80	$0.50
Port Henry to Bethlehem, Pa., and vicinity	1.60	1.00
Port Henry to Reading, Pa., and vicinity	1.65	1.20
Port Henry to Buffalo, N. Y., and vicinity	1.55	.60

By the above-reduced rates a much larger tonnage and a much wider market should prevail for the ores of this district.

To show the importance of this iron traffic we would state that the tonnage shipped from Port Henry from 1885 to 1913, inclusive, amounted to 11,427,629 gross tons of iron ore, and the inward tonnage for the same period, consisting principally of coal, coke, and limestone, is estimated to have been at least 3,000,000 tons.

Shipments of pig iron from Port Henry from 1883 to 1910, inclusive, are not included in this report, but it is estimated that for the 28 years preceding 1911, shipments of pig iron averaged 50,000 tons per year, or 1,4000,000 tons.

The following shipments and receipts have been made during the past three years:

SHIPMENTS.

	Witherbee, Sherman & Co. (iron ore).	Port Henry Iron Ore Co. (iron ore).	Cheever Iron Ore Co. (iron ore).	Northern Iron Co. (pig iron).	Tons.
1911	535,114	129,986	3,585	59,823	728,508
1912	552,063	91,301	36,183	47,777	727,344
1913[1]	599,000	93,500	44,000	67,721	801,221
Grand total					2,257,073

[1] Estimated as of December, 1913.

RECEIPTS.

	Witherbee, Sherman & Co. (coal).	Port Henry Iron Ore Co. (coal).	L. C. & M. R. R. Co. (coal).	Northern Iron Co. (coke and limestone).	Estimated merchandise.	Total receipts.
1911	22,576	4,659	6,335	88,203	27,000	148,773
1912	26,182	4,301	5,822	60,183	27,000	123,488
1913[1]	32,128	6,301	6,801	101,083	27,000	173,313
Grand total						445,574

[1] Coal receipts up to Dec. 1, 1913.

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A summary of the above would be about as follows:

Shipments of iron ore 1883 to 1910, inclusive	9,342,877
Shipments of pig iron 1883 to 1910, inclusive (estimated)	1,400,000
Shipments of pig iron and iron ore during the years 1911, 1912, 1913, as above	2,257,073
Receipts of coal, coke, and limestone, 1883–1910 inclusive (estimated)	2,500,000
Receipts of merchandise 1883 to 1910, inclusive (estimated)	756,000
Receipts of coal, coke, limestone, and merchandise during the years 1911, 1912, 1913, as above	445,574
Total receipts and shipments 1883 to 1913, inclusive	16,701,524

In addition to its importance as an iron ore distributing point, Port Henry is a large distributing point for merchandise to the adjacent towns. There are two national banks, a shirt factory, a blast furnace, railroad shops, a large electric power plant, a flour mill, a gas and electric light plant, a weekly newspaper, and numerous stores.

The necessity for dredging the harbor at Port Henry is due to the fact that boats and barges likely to navigate the barge canal will have a draft of 10 feet and a carrying capacity of from 1,500 to 1,800 tons, as against the present type of canal boats drawing 4½ feet of water, with a carrying capacity of 150 tons; hence the necessity of dredging the harbor of Port Henry to accommodate this new type of boat.

Port Henry has been designated as a barge canal terminal and the State is to extend the present steamboat dock at Port Henry out into the lake to a length of 550 feet and a width of 125 feet and this dock will be open for shipments of ore and other material from Port Henry and also for the receipts of coal and other material coming into the port of Port Henry.

With the benefits likely to accrue from the barge canal there will be at least an outward tonnage from Port Henry annually of 1,500,000 tons and an inward tonnage of not less than 180,000 tons, principally coal and coke. Provision should be made for an anchorage harbor for this traffic for a fleet of about 30 boats which would probably average about 250 feet in length, as the traffic will be an irregular one, and frequently there will be a fleet waiting for loads aggregating the above number.

To give a depth of 12 feet to this harbor would not require any rock excavation, but simply the removal of silt that has accumulated. Suction dredges can be used and part of the silt disposed of for filling in the concrete State Terminal Dock referred to above, and there will also be from private owners an opportunity of taking care of any additional silt that may be taken out by the Government for filling in private water fronts.

PORT HENRY BOARD OF TRADE.
Represented by F. S. WITHERBEE.

Col. W. M. BLACK,
Corps of Engineers.

LETTER OF MESSRS. WITHERBEE, SHERMAN & CO.

NEW YORK CITY, *January 2, 1914.*

DEAR CAPT. BLACK: I beg leave herewith to submit to you some data in reply to your inquiries made when I recently saw you in Albany.

Additional data as to shipments and receipts of Port Henry Harbor.—I have somewhat amplified and brought down to January 1, 1914. the data contained in the previous report submitted to you by the Port Henry Board of Trade on May 11. 1911. which will give you, I think, the additional data you desire as we have made it out more in detail.

Time of round trip between Port Henry and New York City.—I herewith quote the following extract made from the report from Commander Alfred Brooke Fry, of the United States Engineer Corps, on this subject:

"*The use of towboats owned by barge owners.*—A towboat (steam) that could handle, say, two of the 270-foot barges and give them a canal speed of, say, 4 miles an hour in canal prism, and, say, 5 to 6 miles an hour in the restricted river waters, and, say, 6 to 8 miles an hour in deep water, would be probably 115 to 120 feet long over all; say 27-foot beam and 9-foot draft. She should develop, say, 600 to 700 horsepower, and would probably cost, equipped, from $55,000 to $65,000. Her time-table from Port Henry to Jersey City, bringing down, say, two 270-foot barges, would be something as follows:

	Hours.
Port Henry to Whitehall, say 40 miles, at speed average of, say, 5½ miles an hour, say	7
Whitehall to Fort Edward, say, 22 miles, at 4 miles	5½
(Plus, say, 5 hours for 5 lockages of 3 vessels)	5

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	Hours.
Fort Edward to Albany, say 56 miles, at 5 miles	11
(Plus 6 hours for 6 lockages, for 3 vessels)	6
Albany to Jersey City, 148 miles, say	24
Total	58½

"(It is assumed that the tide in the Hudson River would, in the long run, help as much as hinder.)

"Total, say 60 hours, or 2½ days for run from Port Henry to Jersey City."

To the above total of 60 hours should be added 24 hours delay for loading at Port Henry and 36 hours for unloading at New York, so that the round trip should be estimated at 180 hours, or 7½ days, as against 15 days for present small canal boats.

Estimated saving in cost of coal via barge canal at Port Henry as compared with present price of coal delivered by all rail.—We are paying for a Clearfield district, Pennsylvania, bituminous coal $1.35 per ton f. o. b. at mines. Adding the all-rail freight to Port Henry, $2.75 per ton, makes the present price of coal $4.10 per ton delivered. Assuming the same price for coal at mines with present rate of freight to New York Harbor of $1.55 and estimating freight by barge canal from New York to Port Henry at 50 cents per ton would make the same coal cost at Port Henry via barge canal, delivered, $3.40 per ton, or, say, a saving of 70 cents per ton. The above estimate of freight on coal from New York to Port Henry is a conservative one, as there will be a very much larger tonnage of ore from Port Henry to New York than there will be of coal from New York to Port Henry, and the rate of freight both ways is based on 50 cents per ton. A large and responsible transportation company has submitted these figures to us. Estimates we have received from Commander Fry and other transportation authorities state that we can handle the material for below 40 cents per ton should we build and operate our own boats.

Map showing old course of Mill Brook at Port Henry.—We have made an exhaustive search for the map you asked us for, showing the former course of this stream, but can not find any map showing this. There have been in the past 30 years at least three floods down this stream, caused in each instance by freshets carrying away dams. These dams have recently been rebuilt and strengthened under the direction and approval of the New York State Conservation Commission, and there ought not to be as much danger from floods in the future.

After keeping you so long waiting for the above data, I hardly feel like asking you to push along the Port Henry Harbor matter, but we do feel the necessity of having the harbor dredged before the opening of the barge canal in 1916, and we would like very much if possible to get the matter to Congress in time to get some action taken on it during this present session, and anything you can do to help us to do this will be appreciated by us.

Yours, very truly,

F. S. WITHERBEE, *President.*

Capt. R. D. BLACK,
Corps of Engineers.

LETTER OF MESSRS. WITHERBEE, SHERMAN & CO.

NEW YORK, N. Y., *February 9, 1914.*

DEAR SIR: Your letter of the 5th instant to Mr. F. S. Witherbee is at hand.

In this letter you ask for a figure representing roughly the total investment of all parties concerned in the iron industry to-day in the neighborhood of Port Henry.

Mr. Witherbee is in Bermuda but is expected back the latter part of this week, and full answer to this part of your letter will be deferred until his return.

Replying to that portion of your letter requesting information in connection with the manufacture of fertilizer, beg to say that as a by-product from the concentration of Witherbee, Sherman & Co.'s old bed ore, there is a material running 5 to 7 per cent in phosphorous. A further concentration raises the phosphorous several points.

A series of experiments covering several years has proven the fact that this phosphatic by-product is valuable as fertilizer. On certain soils very excellent results have been shown when the tailings have been ground fine and used alone. Results equalling those obtained from standard fertilizers have been shown from the use of the tailings mixed with barium, and a plant capable of producing about 35 tons per day of ground and mixed fertilizer has just been completed at Port Henry and will be started immediately. If this plant is a success, it will be increased very much in size, as we have on the bank at Mineville over 400,000 tons of the phosphate tailings, which can be utilized and are also producing same at the rate of perhaps 200 to 300 tons per day.

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If you desire more detailed information in connection with this matter, we should be glad to give it to you, and awaiting your pleasure, we remain,

Yours, truly,

L. W. FRANCIS, *Secretary.*

Mr. A. C. HARPER,
Assistant Engineer.

LETTER OF THE DELAWARE & HUDSON CO.

ALBANY, N. Y., *February 12, 1914.*

MY DEAR CAPTAIN BLACK: To-day I had a conference with Mr. MacMartin, chief engineer of this company, and Mr. Loomis, general manager of the Champlain Transportation Co., relative to the proposed work to be done at Port Henry in creating the barge canal terminal and the breakwater which I believe is being considered by you.

It would seem that during the construction of the dock and breakwater, at least for all of next summer, it will be necessary for the steamboats of the Champlain Transportation Co. to land at the powerhouse dock, and Mr. Loomis is going to take this matter up with the Witherbee-Sherman people and obtain permission to do so. It is just possible that some little dredging will have to be done in front of the dock.

It was the opinion of all of us that the situation at Port Henry would be best served by diverting Mill or Roaring Brook so that it will run into the lake at a point just north of the proposed public dock; that the proposed public dock be extended on out into the lake and thus forming the breakwater; that finally for the landing of the steamboats of the Champlain Transportation Co. and other companies, a "T" be formed at the end of the dock, which would make the end of the breakwater possibly 100 feet long, and these boats could land at that point without loss of time, while if they had to circle to reach a point along the west face of the proposed dock quite a little additional time would be lost, and it would be especially hard and would result in considerable delay for boats coming from the north to make the landing.

Of course, the Champlain Transportation Co. and this company will aid you in any way they can in carrying out this improvement.

Yours, very truly,

C. S. SIMS,
Second Vice President and General Manager.

Capt. R. D. BLACK,
Corps of Engineers.

LETTER OF MESSRS. WITHERBEE, SHERMAN & CO.

PORT HENRY, N. Y., *February 17, 1914.*

DEAR SIR: Yours of the 14th instant received, relative to the lumber industry at Port Henry, N. Y.

In reply, would say we find the Bigalow sawmill produces about 424,000 feet of lumber and 34,000 laths per year, while the Barton sawmill at Moriah, 2 miles back of Port Henry, produces in the neighborhood of 150,000 feet of lumber per year; and Witherbee, Sherman & Co.'s mill at Mineville produces about 600,000 feet of timber and lumber and 150,000 laths per year.

Trusting this will give you the information desired, we are,

Very truly, yours,

P. J. BIGLEY,
Shipping Superintendent.

Mr. A. C. HARPER,
Assistant Engineer.

LETTER OF MESSRS. WITHERBEE, SHERMAN & CO.

NEW YORK, *March 2, 1914.*

DEAR CAPT. BLACK: Yours of February 5th came to hand during my absence in Bermuda.

1. Since my return I have tried in vain to locate some data in reference to the estimate of $7,500.000 made by Maj. McFarland in 1883 as having been expended up to that date in the opening up of the mining properties tributary to Port Henry. A

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number of the properties then operated have either been abandoned or purchased by existing companies, and the system of bookkeeping then used did not show development work as distinguished from mining costs, so it is very difficult to give you the data you want. During the past six years, however, we have kept a separate record of our new construction and mines development work, and from January 1, 1908, to January 1, 1914, it amounted to $1,359,409.33. Basing a rough estimate on the period from 1883 to January 1, 1908, and from what I can learn has been done by other operating companies, I would estimate that at least $6,000,000 has been spent since 1883, or say a total of $13,500,000 to January 1, 1914.

2. It is practically impossible also to say how much has been invested by the present operating companies in their different properties. Like ourselves, they started 50 or 60 years ago with small investments, and all their large purchases since have been made out of profits, with no new capital added. Most of their old books have been destroyed or lost and the only way I can arrive at an estimate is by conferring with the other ore people and looking over what little data I have found accessible. In this way I have made up an estimate that at least $6,000,000 must have been invested in the purchase of the different ore properties.

3. I find that our secretary, Mr. Francis, has written you in reference to our proposed fertilizer plant. I might add that this by-product is likely to develop into a large tonnage, as we have accumulated at Mineville something like 500,000 tons of tailings from our mining plant. The fertilizer product is likely to be largely shipped by water, in order to reach points on the New York State Barge Canal system at the lowest rates.

4. In reply to your personal inquiry as to the number of stockholders and employees in the various ore companies, I would say that there are 52 stockholders, but as the Bethlehem Steel Co. and the Lackawanna Steel Co. are classed as individual stockholders, it might be fair to give the number of stockholders in these two companies, which totals about 2,300. The number of employees of the different companies working about a year ago, which is a fairer basis than the present depressed period, was about 2,400 in the aggregate.

If there is any other data that I can give you I shall be very glad to have you call upon me for the same. I am sorry to have been delayed so long in giving you the above data, but I have spent a great deal of time trying to locate some definite figures, but, as I have said above, the task has been a very unsatisfactory one.

Yours, very truly,

F. S. WITHERBEE, *President*.

Capt. R. D. BLACK,
Corps of Engineers.

LETTER OF THE CHAMPLAIN TRANSPORTATION CO. AND THE LAKE GEORGE STEAMBOAT CO.

BURLINGTON, VT., *October 23, 1914*.

DEAR SIR: Referring to the communication from Assistant Engineer A. C. Harper dated October 19, and returning with this the project of improvements at Port Henry, N. Y., which were sent me for the purpose of discussing the matter personally with you. As certain representations were made to you in our consultation yesterday, I believe you will consider the matter and will take such action in the premises as will safeguard the interests of navigation at that point.

The following facts are set forth in connection with the matter:

First. This company own no property whatever at Port Henry, and such landing privileges as have previously been accorded us has been by lease, the dock which we have used being the property of the Witherbee-Sherman Co., shown on your sheet No. 1, just south of the power house and at the proposed location of the Barge Canal Terminal.

Second. When the work of the Barge Canal Terminal had reached a certain stage we were forced to discontinue the landing place which had been used for many years and seek a new place; we were finally given wharfage privileges at a dock, which I have marked in red ink "A." We expected to drive fenders and repair work, some three hundred dollars, to make this temporary landing place available.

In view of the above it is not my thought that we have very much to offer in the way of suggestions for landing privileges at Port Henry. Agreeable to your wishes, however, I am offering the following concerning the proposed Government work, as indicated on your chart No. 3, for your consideration:

First. It is our belief that the construction of a breakwater, as indicated by white line, is unnecessary and requires a greater expense than is warranted. To furnish pro-

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tection for barges loading at the ore docks, if the 500-foot pier now under construction is not sufficient, then our suggestion is that the pier be continued for 500 or 1,000 feet more. The breakwater, we believe, would cause delay in maneuvering towboats and would render the landing of steamboats much more inconvenient than as now proposed.

Second. We would recommend that the Barge Canal Terminal pier be faced on the northeasterly side instead of riprapped, as proposed. Vessels making only temporary landings would, under ordinary conditions, be able to land either alongside the northeast face or across the southeast end, and if they were to lay up there overnight then they would land on the southwest side and tie up. This arrangement would, in our opinion, increase the convenience of the proposed terminal pier.

Third. The diversion of Mill Brook to the northerly side of the terminal pier would, in our opinion, leave a silt deposit covering a very considerable area that would have to be removed on frequent occasions. Possibly that diversion might be made at a point more to the northward of the power-house station and the Barge Canal Terminal. If it could be brought in to a point north of Weston's Coal Dock or the Witherbee shed, there is a greater depth of water and it would probably not interfere with navigation interests to the Barge Canal Terminal.

In letter from J. A. O'Connor, terminal engineer, department of state engineer and surveyor, barge canal terminals, dated February 5, 1914, the following expression occurs:

"After the construction of this pier it is expected that the steamboats will land either at the end or on the south side of the pier, where ample dockage facilities will be afforded."

In view of this fact I most earnestly urge that the northeasterly side of the terminal pier be faced instead of riprapped, as the plans called for, thereby making the northeasterly side equally as accessible as is the southwesterly side and the easterly end.

If it is consistent with the instructions to your office, may I ask you to furnish me the two sheets of your survey of Port Henry Harbor, N. Y. The ones which I return, one of them contains your markings of the proposed work, and the other one is the straight print without markings. The drawings indicate that there are two sheets, Nos. 1 and 2, and if it is permissible for me to have these, I would appreciate your sending them.

Yours, truly,

D. A. LOOMIS, *General Manager.*

Maj. M. J. McDONOUGH,
Corps of Engineers.

LETTER OF MAJ. M. J. McDONOUGH, CORPS OF ENGINEERS.

WAR DEPARTMENT,
UNITED STATES ENGINEER FIELD OFFICE,
NORTHERN SECTION, FIRST DISTRICT, NEW YORK CITY,
Albany, N. Y., July 22, 1915.

DEAR SIR: 1. In connection with our recommendation upon a survey of the harbor at Port Henry, it is desired to submit authentic plans of the pier and dock construction contemplated at that place by the State of New York.

2. The questions which we particularly desire to answer are:

(*a*) What is the location, character, and extent of improvements contemplated by the State of New York, and the probable time of their completion?

(*b*) Is it probable that the State of New York will at any future time extend its pier to the eastward?

(*c*) Will the completed pier be so constructed as to admit of extension to the eastward and southward without impairing its usefulness?

3. Inasmuch as I am required to forward my report within a very few days, a prompt reply will greatly oblige.

By direction of Maj. M. J. McDonough, Corps of Engineers.

Very truly, yours,

A. C. HARPER,
Assistant Engineer.

Mr. D. B. LADU,
Special Deputy State Engineer, State Hall, Albany, N. Y.

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LETTER OF MR. D. B. LADU.

STATE OF NEW YORK,
DEPARTMENT OF STATE ENGINEER AND SURVEYOR,
OFFICE OF SPECIAL DEPUTY,
Albany, July 23, 1915.

DEAR SIR: Responding to your letter dated July 22, 1915, and signed by Mr. A. C. Harper, assistant engineer, requesting certain information in reference to the terminal being built by the State of New York at Port Henry, N. Y., you are informed as follows:

(*a*) The location of the terminal pier, as indicated on the contract drawings, is east of the Witherbee-Sherman power house at Port Henry. The improvements contemplated under Terminal Contract 25 include the construction of a pier 500 feet in length, extending out into Lake Champlain. On the southerly side of this pier a concrete dock wall will be constructed. The surface of the pier will be covered with gravel, the north slope being riprapped down to the water's edge. A harbor, approximately 600 feet in width, lying directly south of the pier, will be dredged to deep water at elevation 82.5, New York State datum. The improvement also includes the diversion of Mill Creek so that it will empty into Lake Champlain at a point directly north of the terminal pier.

(*b*) At the present time there is no intention of extending the pier beyond the limits shown on the plan.

(*c*) From an engineering standpoint it will be entirely feasible to extend the pier eastward and southward. However, an extension to the southward might impair the use of the harbor by restricting the entrance.

Accompanying this letter are the plans for Terminal Contract 25, which, together with the above answers to your questions, I believe will give you the information desired.

Yours, very truly,

D. B. LADU,
Special Deputy State Engineer.

Maj. M. J. MCDONOUGH,
Corps of Engineers.

LETTER OF LAKE CHAMPLAIN & MORIAH RAILROAD CO.

NEW YORK CITY, *July 21, 1915.*

DEAR SIR: Will you kindly inform the Board of Army Engineers that the local interests of Port Henry will be very glad to contribute $10,000 toward the proposed Government harbor if located there as outlined by the members of the board when at Port Henry.

Yours, very truly,

F. S. WITHERBEE, *President.*

Col. W. M. BLACK,
Corps of Engineers.

[First indorsement.]

THE DISTRICT ENGINEER OFFICE, FIRST DISTRICT,
New York City, July 22, 1915.

To the BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

For the information of the board.

W. M. BLACK,
Colonel, Corps of Engineers.

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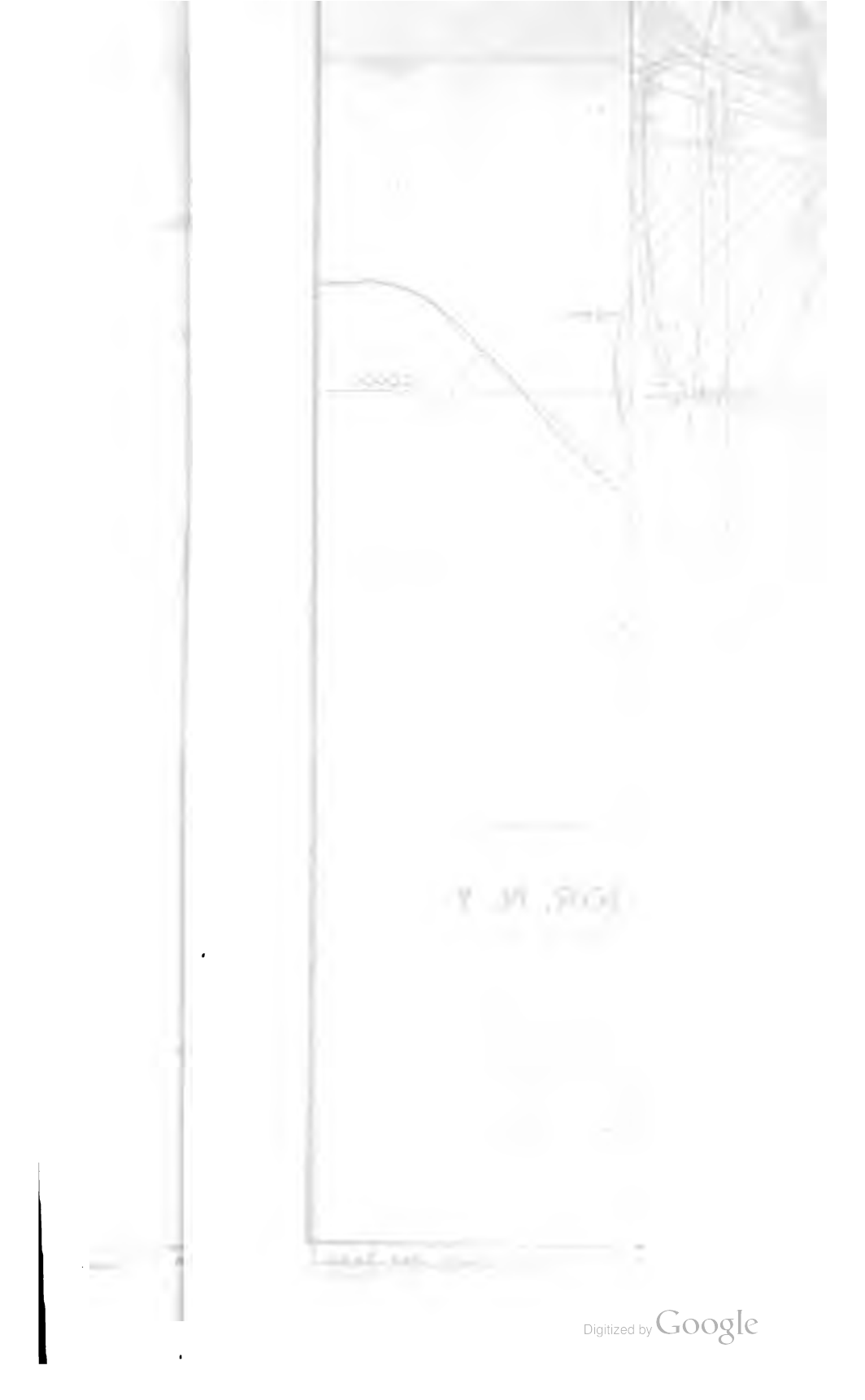

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 370.

WESTCHESTER CREEK, N. Y.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORTS ON PRELIMINARY EXAMINATION AND SURVEY OF WESTCHESTER CREEK, N. Y.

DECEMBER 13, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 10, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated 6th instant, together with copies of reports from Col. W. M. Black, Corps of Engineers, dated June 17, 1914, and June 23, 1915, with map, on preliminary examination and survey, respectively, of Westchester Creek, N. Y., made by him in compliance with the provisions of the river and harbor acts approved July 25, 1912, and March 4, 1913.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 6, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination and survey of Westchester Creek, N. Y.

1. There are submitted herewith for transmission to Congress reports dated June 17, 1914, and June 23, 1915, with map, by Col. W. M. Black, Corps of Engineers, on preliminary examination and

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survey, respectively, authorized by the river and harbor act approved July 25, 1912, of Westchester Creek, N. Y., and by the river and harbor act of March 4, 1913, of Westchester Creek, N. Y., with a view to providing a channel width of 150 feet up to the point where it is crossed by the Fort Schuyler Road.

2. Westchester Creek enters an estuary on the north side of East River, about 14 miles east of the Battery, New York City. The present project, adopted by the river and harbor act of June 25, 1910, provides for a channel 8 feet deep at mean low water and 100 feet wide across the estuary; thence 80 feet wide to about 1,000 feet above Scrivens Wharf; and thence 60 feet wide to the head of navigation, at an estimated cost of $91,280. The project is practically completed. The commerce has increased from about 50,000 tons in 1891 to 169,164 tons in 1912, and 589,322 tons in 1914. The existing navigation facilities appear to be inadequate for the proper handling of the vessels engaged in traffic on this stream. The district officer, who is also the division engineer, estimates that to increase the depth to 10 feet and the width to 150 feet, as specified in the river and harbor act of March 4, 1913, will cost $375,000. He deems this expenditure larger than resulting benefits would warrant, but believes the locality is worthy of further improvement to the extent of providing a channel 10 feet deep, 125 feet wide at Unionport and Westchester, and 100 feet wide elsewhere, at an estimated cost of $291,000 for construction and $1,500 annually for maintenance.

3. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated September 28, 1915. The board concurs in general with the views of the district officer, but believes that a width of 100 feet throughout will fairly well serve the needs of commerce, and that any additional width required in order to reach the wharves at Unionport and Westchester should be provided by the interests concerned. The estimated cost of the project as thus modified is $208,000.

4. After due consideration of the above-mentioned reports, I concur in general with the views of the district officer and the Board of Engineers for Rivers and Harbors, and therefore report that the further improvement by the United States of Westchester Creek, N. Y., is deemed advisable to the extent of providing a channel 10 feet deep at mean low water and 100 feet wide, from East River to the Fort Schuyler Road at Westchester, at an estimated cost of $208,000 for first construction and $1,500 annually for maintenance, subject to the condition that the necessary right of way across upland lying between the harbor lines as established by the Secretary of War May 2, 1914, shall be furnished free of cost to the United States before work is begun under the new project. The first appropriation should be $80,000 and the balance provided so as to complete the work in three years.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

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REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS ON SURVEY.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 28, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's reports on preliminary examination and survey of Westchester Creek, N. Y., and Westchester Creek, N. Y., with a view to providing a channel width of 150 feet up to the point where it is crossed by the Fort Schuyler Road, authorized by the acts of July 25, 1912, and March 4, 1913.

2. Westchester Creek lies wholly within the limits of Greater New York and empties into a bay on north side of East River about 14 miles east of the Battery, New York City. The distance from deep water in the river to the head of navigation at the Fort Schuyler Road is 2¾ miles.

3. The present project, adopted by the act of June 25, 1910, provides for a channel 8 feet deep at mean low water and 100 feet wide across the estuary; thence 80 feet wide to about 1,000 feet above Scrivens Wharf; and thence 60 feet wide to the head of navigation, at an estimated cost of $91,280, and $2,000 annually for maintenance. To June 30, 1915, about $83,192.23 had been expended. The project is practically completed. The mean range of tide is 6.8 feet.

4. The commerce of the creek has increased from about 50,000 tons in 1891 to 169,164 tons in 1912, and 589,322 tons in 1914. This commerce is carried on various kinds of vessels ranging in draft from 6 to 11 feet. The existing project appears inadequate for the proper handling of these vessels.

5. The district officer reports the estimated cost of increasing the channel depth to 10 feet and the width to 150 feet, as called for by the act, as $375,000. This amount appears somewhat greater than the resulting benefits would warrant, and estimates are given for a channel 10 feet deep and 125 feet wide at Unionport and Westchester and 100 feet elsewhere, the amount being $291,000 for construction and $1,500 annually for maintenance. The district officer believes that a channel of this capacity will be sufficient to meet reasonable demands and that its cost is warranted.

6. This stream has shown a healthy growth in commere for some years, and it seems clear that the present restricted channel dimensions are inadequate for the successful handling of the large number of vessels engaged in this traffic. Under present conditions the width is insufficient for vessels to pass freely by other vessels lying at the wharves, and the depth is less than many of the vessels call for. It appeared to the board, however, that if the depth were made 10 feet and the width 100 feet throughout the needs of commerce would be fairly well served. The district officer submits an estimate for such a channel in a supplemental report amounting to $208,000, or $83,000 less than for a channel 125 feet in width at Unionport and Westchester and 100 feet elsewhere. It is believed that the 100-foot channel should be adopted, leaving any additional width required in order to reach

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the wharves at the places mentioned to be provided by the interests concerned, the width between harbor lines being only 150 feet at these places. In view of the foregoing, the board recommends the adoption of a project providing for a channel depth of 10 feet at mean low water and a width of 100 feet from deep water in the Sound up to Fort Schuyler Road in Westchester, at a first cost of $208,000 and $1,500 annually for maintenance, subject to the condition that the necessary right of way across upland lying between the harbor lines as established by the Secretary of War May 2, 1914, shall be furnished free of cost to the United States before work is begun under the new project. The first appropriation should be $80,000 and the balance provided so as to complete the work in three years.

7. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

PRELIMINARY EXAMINATION OF WESTCHESTER CREEK, N. Y.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
First District, New York City, June 17, 1914.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Preliminary examination of Westchester Creek, N. Y.

1. The following report upon a preliminary examination of Westchester Creek, N. Y., is submitted in compliance with instructions from the Chief of Engineers, United States Army, dated March 18, 1913, and in pursuance of the requirements of the river and harbor act of March 4, 1913, as follows:

Westchester Creek, New York, with a view to providing a channel width of one hundred and fifty feet up to the point where it is crossed by the Fort Schuyler Road.

2. Westchester Creek lies wholly within the limits of Greater New York. It extends northward about 4 miles from the head of an estuary situated in the north shore of the East River, N. Y., about 14 miles by water east of the Battery, New York City. A swing bridge crosses the creek at Unionport, about three-fourths of a mile above the head of the estuary, and a fixed bridge crosses it at Westchester, about 1 mile above the swing bridge.

3. A survey of Westchester Creek and the estuary as made in 1891, in compliance with the requirements of the river and harbor act of September 19, 1890. The report upon this survey, with estimated cost of improvement, is printed in the Annual Report of the Chief of Engineers, United States Army, for 1891, pages 955–957, and, including a map of the locality, it is printed in House Document No 111, Fifty-sixth Congress, first session. When this survey was

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made a depth of 4 feet at mean low water could be carried over a bar in the estuary, and the creek had a navigable depth at mean low water of not less than 5½ feet up to just above the swing bridge; thence to the fixed bridge, which marks the head of navigation, it was about 3½ feet; above this the stream is narrow, shallow, and tortuous, and is crossed by the New York, New Haven & Hartford Railroad, the only railroad serving this section. It is probable that within recent years the bed of the creek above the fixed bridge has been filled in to a considerable extent by city and railroad improvements. Below the bridge the high water width of the creek varies from about 110 feet at the head of navigation to about 500 feet at the head of the estuary. The estuary, which is but about 500 feet wide at the point where the creek enters it, widens to about 3,000 feet on the East River water front, measured on a line joining Clason and Old Ferry Points. Its length is about 1 mile, thus making the distance from deep water in the East River to the head of navigation in Westchester Creek 2¾ miles. The mean range of tides is 6.8 feet.

4. No action was taken by Congress upon the report and estimate submitted in 1891. In 1899, pursuant to the requirements of the river and harbor act of March 3, 1899, the locality was again examined and a report, with estimated cost of improvement, was submitted November 28, 1899. The report is printed in the Annual Report of the Chief of Engineers, United States Army, for 1900, pages 1433–1435. The project upon which the estimate of 1899 is based provides for a channel 8 feet deep at mean low water and 100 feet wide across the estuary; thence 80 feet wide to about 1,000 feet above Scrivens wharf; and thence 60 feet wide to the head of navigation at Westchester. The lengths of channel included in these several widths are about 2,000 feet, 3,000 feet, and 4,000 feet, respectively. The first appropriation for making the improvement proposed under this project was included in the river and harbor act of June 25, 1910.

5. Up to date, June 17, 1914, $54,780 had been appropriated for this work, of which amount $49,019.07 had been expended in making a channel of the projected widths and 8 feet deep at mean low water from the East River up to about 1,900 feet below the bridge at Unionport, except for a shoal in the east side of the channel about 2,800 feet below this bridge, and thence to the head of navigation at Westchester 6 feet deep at mean low water.

6. In prosecuting the work of dredging the channel of 8-foot depth in 1912–13, it was found that heavy shoaling had occurred in the creek during the preceding two years, and that the banks of dredged cut in many of the reaches took a natural slope of practically 1 on 5 instead of 1 on 3, which latter slope was used in making the estimate of cost of improvement. The shoaling was due mainly to material washed from newly opened, unsurfaced streets through sewers into the creek. It is understood that upon the completion of a system of sewers now under construction for this section discharge will be made into the East River instead of Westchester Creek. These conditions, and the existence of ledge rock within the area to be deepened, but theretofore unknown to exist, increased the total cost of the work to an extent which made it impossible to complete the project within the estimate. It was vitally necessary to the commerce of the creek

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that a fairly navigable channel be carried to the head of navigation, therefore, excavation was carried to a depth of but 6 feet at mean low water in the upper 1½ miles of the creek instead of to the 8-foot depth provided for in the project. As stated in the Annual Report of the Chief of Engineers for 1913, page 1638, it is estimated that to complete the improvement as projected will require funds in addition to the funds already appropriated, to the amount of $36,500. This amount is included as an item in the river and harbor bill now pending.

7. The commerce of the creek which, when the first survey was made in 1891, was estimated at 50,000 tons, valued at $242,000, had increased to 169,164 short tons, valued at $733,236, in the calendar year 1912, and is now reported as amounting to 586,236 short tons, valued at $1,449,659 in 1913. The amount of freight handled by rail during these years amounted to 63,704 tons in 1912, and to 33,844 tons in 1913. The channel of 6-foot depth at mean low water referred to above was completed to the head of navigation in June, 1913.

A comparative statement of the amounts of the several commodities carried by water during the years 1912 and 1913 is as follows:

Article.	1912		1913	
	Short tons.	Valuation.	Short tons.	Valuation
Coal and other fuel	108,034	$484,682	149,633	$660,954
Lumber, shingles, laths, etc	2,589	63,417	4,781	84,668
Manufactured iron and steel			16,834	42,900
Petroleum and products	4,306	75,985	6,332	125,904
Brick	3,568	15,975	30,261	119,900
Building stone and flagging			8,593	66,080
Gravel and sand	10,270	5,276	64,060	30,261
Cement, lime, etc	5,787	51,691	28,875	212,383
Crushed stone	23,034	15,946	56,737	51,252
Paving blocks	336	264	1,476	14,318
Piles			308	3,968
Hay, feed, and straw	280	20,000	125	2,500
Ashes and garbage	10,960		218,271	34,621
Total	169,164	733,236	586,286	1,449,659

It will be noted in the above statement that the increase in the commerce of 1913 over that of 1912 is mainly in building materials. This is accounted for in part by the fact that since the deepening of the channel in 1913 a considerable amount of these materials is shipped by water to Westchester Creek and thence overland by truck to destination on the Bronx River water front and vicinity. No doubt this method of delivery will continue to a large extent until the improved channel to be excavated in the Bronx River under the project printed in House Document No. 897, Sixty-second Congress, second session, and adopted by Congress March 4, 1913, has been made available for navigation. It is probably safe to assume that of the 586,286 tons shipped to Westchester Creek in 1913 approximately 400,000 tons represent the legitimate commerce of the creek at this time. The continuous growth of New York, however, makes it probable that this commerce of Westchester Creek in building materials will continue indefinitely since the continuity of the built-up sections will shortly extend beyond The Bronx.

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8. The dimensions and loaded draft of the vessels engaged in carrying this commerce are approximately as follows:

Class.	Length, feet.	Beam, feet.	Draft, feet.
Canal boats	90	13	6
Barges	119	35	9
Deck scows	120	35	10
Lighters	90	19	10
Schooners	125	30	11

There is no regularly established freight or passenger service navigating the creek on time schedules.

9. The wharves from which the commerce of the creek is mainly carried on appear to be sufficient for present needs. They are located at and near the head of navigation, though a fair volume of business is transacted from the wharves at Unionport. The frontage occupied by the wharves, their condition, equipment, etc., are shown in the following table:

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Serial No.	General location.	Frontage occupied.[1]	Condition.	Equipment.	Size of cargoes limited to—[2]	Efficiency.	Owned by—	Kind of structure.
1	Between Unionport and mouth of creek.	75	Unserviceable.	None.		None.	Private ownership.	Open pile.
2	.....do.	175	Good.	Derrick with engine.	500 tons.	Good.	.....do.	Do.
3	.....do.	75	.....do.	None.	Not known.	Fair.	.....do.	Do.
4	At Unionport.	200	.....do.	.....do.	.....do.		.....do.	Do.
5	.....do.	50	.....do.	.....do.	.....do.		.....do.	Do.
6	.....do.	125	Fair.	Derrick; no engine.	500,000 brick.	Fair	.....do.	Solid fill behind pile and timber bulkhead.
7	.....do.	250	Excellent.	Steam hoist.	450 tons.	Excellent.	.....do.	Do.
8	.....do.	100	.....do.	None.	.....do.	Fair.	City [3]	Open pile.
9	.....do.	240	.....do.	2 steam hoists.	450 tons or 100,000 gallons oil.	Excellent.	Corporation.	Solid fill behind timber bulkhead.
10	Midway between Westchester and Unionport.	([4])		2 pipe lines.	250,000 gallons oil.	Fair.	.....do.	Natural earth slope; pipe line supported on rubble stone foundation about 6 feet wide.
11	Upper 750-foot section of creek under improvement.	225	Good.	None.	200,000 feet lumber or 200,000 brick.	.....do.	Private.	Pile.
12	.....do.	100	Fair.	Steam hoist.	500 tons.	Good.	.....do.	Pile with fill behind stone bulkhead in rear.
13	.....do.	150	Excellent.	Derrick with engine.	450 tons.	.....do.	.....do.	Open pile with solid fill behind bulkhead in rear.
14	.....do.	175	Good.	.....do.	.....do.	.....do.	.....do.[5]	Open pile.
15	.....do.	100	Excellent.	None.		Fair	City [3]	Do.
16	.....do.	400	Very poor.	Steam hoist and 3 derricks without engines.	450 tons.	Poor.	Private.	200-foot pile; 200-foot pile and timber bulkhead.

[1] Linear feet.
[2] Limited by depth of water available for navigation.
[3] Open to public, rates same as New York City.
[4] See last column.
[5] Open to public, wharfage charge $4 per day.

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None of the wharves have rail connections All freight carried by rail is transferred by truck to and from the freight station situated about 1½ miles from the business center of Westchester and about the same distance from Unionport These business centers are adjacent to the water front The conditions governing the transfer of freight between water and rail carriers would appear to indicate that no mutual contract exists between any of the water carriers and the railroad for the interchange of traffic by prorating as to such long distance traffic as may be desired to be carried partly by rail and partly by water to its destination.

10. In the transportation of coal there is a difference in rates in favor of carriage by water of about 14 cents per ton. In building materials, except lumber, the railroad rates from Manhattan, New York City, to the freight station most convenient to Westchester and Unionport are uniformly 6 cents per hundred pounds. To this must be added the cost of transfer by trucks to storage yards. While the actual rates by water could not be ascertained it may be safely stated that these rates, exclusive of the cost of transfer by truck, will average not less than 30 cents per ton less than the railroad rates.

11. The lumber carrying vessels are, as a rule, too large to enter the creek. The loaded draft of these vessels ranges from about 13 feet to 17 feet. Therefore, shipments are made to New York City where the cargo is lightered for transfer to Westchester Creek at a cost of $1.25 per thousand feet. To this must be added the cost of water carriage to New York City, which averages about $3 per thousand, making a total cost for delivering to the consignee located on the water front of the creek of $4.25 per thousand feet. When needed in a hurry shipments are made by rail in comparatively small quantities, the annual total of which, however, is comparatively large. The freight charges on these shipments average about $4 per thousand feet. To this must be added a charge of about 50 cents per thousand for transfer by truck from railroad station to consignee, making a total of $4.50 per thousand feet. The foregoing has reference only to shipments from the State of Maine. While the rates on shipments from other localities are somewhat higher per unit the difference in favor of shipment by water remains about the same.

12. The roads connecting the railroad freight station, business center, and all but the wharves situated below Unionport are macadamized, and in good condition. The adjacent streets are also, as a rule, in fair condition, and from present indications extensive street improvements may be expected in the near future. The City of New York has recently laid out a complete street system covering several square miles of this section of Greater New York, some of which have been opened up as highways; a system of sewers has been designed and partly built; and a new drawbridge over Westchester Creek at Unionport is being erected. Also one of the branch lines in extension of the rapid transit system of New York City, now under construction, is to pass through Westchester close to the head of navigation.

13. There is every indication that an enlargement of the existing project for the improvement of Westchester Creek must be undertaken in the near future if the prospective needs for efficient water transportation for this locality are to be met. That the present adopted width of but 60 feet is insufficient for free and unhampered movement by boats of the dimensions now using the creek is undoubted.

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14. Public hearings were held by the New York Harbor Line Board on May 1, 1912, and March 19, 1913, for the purpose of rectifying and more accurately defining the pierhead and bulkhead lines in Westchester Creek approved by the Secretary of War June 29, 1894. It developed at these hearings that widening of the channel to 150 feet was desired and that the property owners and city authorities were in favor of granting a right of way free of cost to the United States, through any uplands that might lie within harbor lines so modified as to permit of excavating a channel to this desired width. These hearings resulted in the harbor line board recommending the adoption of lines "which provide for a channel width in no place less than 150 feet." These modified lines, the locations of which are shown on the accompanying blue print, were approved by the Secretary of War May 2, 1914, with the proviso that "The establishment of the harbor lines which cross upland shall not be effective until such time as the Secretary of War is satisfied that right of way across upland so cut off shall have been granted free of cost to the United States." The width of 150 feet between the harbor lines was established in order to make provision for future developments; since the commercial growth of the vicinity is such that if not taken now, the value of the lands bordering on the cree will increase to an extent which would make a future taking prohibitive in cost.

15. As stated in paragraph 13 preceding, the present adopted width of 60 feet is insufficient for the present needs of commerce. On the other hand, the width of 150 feet desired by the interests concerned is without doubt considerably greater than is necessary to meet the present needs of commerce. Also the cost of making such a channel would exceed an amount which could be considered a profitable investment on the part of the United States, considering the commerce of to-day and of the immediate future.

16. In a stream like Westchester Creek the wharves border the creek and the width of fairway must be sufficient to permit a barge to lie on either side with room between for passing vessels. In my opinion the results of the examination made as reported upon herein have shown that the present adopted width of channel, particularly at and above Unionport, is insufficient for safe and unhampered navigation and satisfactory economical results in the transportation of the commerce of the creek. It is accordingly recommended that data be secured by survey and that upon completion of the survey a report thereon, with estimate of cost of improvement and map of the survey, be submitted. The map [1] of the locality already prepared and in use in connection with the present adopted project contains all necessary information except as to the elevation above datum of the uplands, which may be affected if further improvement of the creek is to be made and the determination by borings of the character of the material to be removed. The cost of the additional surveys necessary is estimated at $300. There are sufficient funds available from the appropriation of July 25, 1912, for the payment of all expenses which may be incurred in connection with the making of the survey and preparing a map thereof.

17. There are no questions of terminal facilities, water power, or other subjects which could be so coordinated with a project for improvement as to lessen the cost of the work and compensate the Gov-

[1] Not printed.

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ernment for expenditures made in the interests of commerce and navigation.

18. Inclosed herewith are copies [1] of corresppondence with their respective inclosures and marked "Exhibit A" to "Exhibit E," inclusive.

19. In my opinion the locality is worthy of further improvement to an extent to be determined after making the survey recommended above.

W. M. BLACK,
Colonel, Corps of Engineers.

[Second indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
June 30, 1914.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. For reasons stated herein the board concurs with the district officer, who is also the division engineer, in recommending a survey in order to determine the extent and advisability of the improvement.

For the board:

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

SURVEY OF WESTCHESTER CREEK, N. Y.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
First District, New York City, June 23, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Report on survey of Westchester Creek, N. Y.

1. The following report on a survey of Westchester Creek, N. Y., is submitted in compliance with department letter of July 6, 1914, and pursuant to the requirements of the river and harbor acts of July 25, 1912, and March 4, 1913. The item in the act of July 25, 1912, reads "Westchester Creek, New York," and that of March 4 1913, reads "Westchester Creek, New York, with a view to providing a channel width of one hundred and fifty feet up to the point where it is crossed by Fort Schuyler Road."

2. Westchester Creek empties into a bay on the north side of the East River, N. Y., about 5¼ miles east of Hell Gate. A description of the locality and of the existing project for improvement is contained in the report upon the preliminary examination submitted June 17, 1914, to which attention is invited for many details not included in this report. The existing project was completed in May, 1915, except for the removal of a few unimportant points of rock which it is intended to remove after the city of New York has completed its work of bridge construction now in progress at Unionport and which work would interfere with rock removal operations.

3. It is stated in paragraph 14 of the preliminary report that, at public hearings held by the New York Harbor Line Board in 1912

[1] Not printed.

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and 1913, it developed that the property owners and the city authorities were in favor of granting a right of way for a better channel free of cost to the United States. The accompanying map shows the harbor lines which were recommended by the Harbor Line Board as the result of these hearings, and which were approved by the Secretary of War, May 2, 1914, with a proviso that "The establishment of any portions of the harbor lines which cross upland shall not be effective until such time as the Secretary of War is satisfied that right of way across upland, so cut off, shall have been granted free of cost to the United States."

4. The amount and value of the commerce of the Westchester Creek and the number, tonnage, and draft of the vessels employed therein during the calendar year 1914 are given in the following tables. The totals given may vary slightly from the true amounts, due to the fact that returns have not been received from one or two concerns whose water-borne commerce is included, the amount of which was obtained indirectly from other sources.

Freight handled in 1914.

Articles.	Amount (customary units).	Short tons.	Value.
Brick (building)	8,451,000 brick	16,902	$50,580
Brick (fire)	10,000 brick	20	302
Cement	11,300 barrels	2,260	16,250
Lime	7,800 barrels	1,092	11,706
Gravel	14,270 cubic yards	19,027	14,758
Sand	28,085 cubic yards	57,447	15,857
Crushed stone	47,200 cubic yards	68,180	47,860
Paving block	15,000 blocks	208	900
Riprap	5,000 cubic yards	7,500	3,000
Flagging	5,113 short tons	5,113	35,574
Lumber	797,466 feet b. m.	2,196	24,264
Lath	13,500 bundles	148	5,400
Plaster	1,000 short tons	1,000	10,000
Ties (old)	1,000 ties	51	100
Engines and machinery	12 short tons	12	1,000
Pipe	493 short tons	493	10,596
Structural steel	900 short tons	900	34,200
Coal	118,726 long tons	132,973	609,623
Ashes	150,000 cubic yards	225,000	15,000
Cellar dirt	48,000 cubic yards	61,333	6,100
Petroleum products	1,465,000 gallons	5,392	102,484
White sand	80 cubic yards	107	100
Curbing	12,000 linear feet	1,500	6,000
Rails	468 short tons	468	19,000
Total		589,322	1,040,684

Vessels employed in trade in 1914.

Class.	Number of vessels.		Total number of—		Tonnage of vessels.[1]		Draft (feet).	
	American.	Foreign.	Arrivals.	Departures.	Least.	Greatest.	Least.	Greatest.
Registered:								
Steamers	2	.....	2	2	131	131	7	7
Towboats	518	.....	518	518	35	80	8	10
Sailing vessels	4	.....	4	4	100	100	8	8
Canal boats, lighters, barges, etc.	297	.....	297	297	250	600	7	12
Miscellaneous craft	19	.....	19	19	66	66	6	6
Unregistered:								
Canal boats, lighters, barges, etc.	891	.....	891	891	250	700	7	11

[1] The tonnage given represents the net registered tonnage in the case of registered vessels and the carrying capacity tonnage in the case of unregistered vessels.

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5. The types and dimensions of the vessels using this waterway are given in paragraph 8 of the report on the preliminary examination. The above table shows that during the calendar year 1914 the arrivals and departures of vessels employed in the commerce of Westchester Creek amounted to 3,462, of which about 69 per cent were canal boats, barges, etc., drawing from 7 to 12 feet loaded, and about 30 per cent were tugboats drawing 8 to 10 feet. From inquiry it appears that the most popular size of barges used in the brick, broken stone, and sand trade have an average length of 112 feet, breadth of 33 feet, and loaded draft of 10 feet, though many of the barges now using the creek have a length of 120 feet, a width of 35 feet, and a loaded draft of 10 feet.

6. Referring to paragraphs 10 and 11 of the preliminary report, it will be noted that investigation showed a difference of 14 cents per long ton of coal in favor of water over rail rates; a safe margin of 30 cents per long ton in favor of water rates on building materials; and a margin of 25 cents on lumber. Using these figures as a basis in calculating the amount saved in 1914 to local business interests by using the creek for the transportation of materials, instead of the railroad, the results are as follows:

132,973 short tons of coal, at 12½ cents	$16,621.62
160,336 short tons of building materials, at 26 5/10 cents	42,970.05
7,265 short tons of miscellaneous freight, at 26 8/10 cents	1,947.02
2,344 short tons of lumber and laths, at 22 2/10 cents	522.71
Total in favor of water rates over rail rates	62,061.40

The difference in cost of haulage between railroad stations and business centers, and wharves and business centers, is not considered in the foregoing. The railroad stations are situated about 1½ miles from the business centers, whereas the business centers are adjacent to the water front.

7. The existing channel is 8 feet deep at mean low water and but 60 feet wide, from near the mouth of the creek to the head of navigation. It is estimated that by increasing the depth of this channel to 10 feet, the same as provided for navigation in the Bronx River, N. Y. (H. Doc. No. 897, 62d Cong., 2d sess.), and increasing the width to meet the present requirements of navigation, a reduction averaging about 3 cents per ton on coal; about 5 cents per ton on building materials, etc.; and a reduction of from $1.25 to $1.50 per thousand feet on lumber, will result. Based on the amount of freight handled in the calendar year 1914, as reported herein in paragraph 4, the total reduction in freight charges on materials carried by water would be as follows:

132,973 tons of coal, at 3 cents	$3,989.19
167,601 tons of building materials, etc., at 5 cents	8,380.05
797,466 feet b. m. of lumber	996.83
Total annual saving in freight charges	13,366.07

8. The average annual cost of maintaining a channel 10 feet deep and 100 to 150 feet wide is estimated at $1,500. During the first few years the annual cost will no doubt be greater than this, but experience has shown that eventually it will, in all probability, fall much below this estimate of $1,500. Deducting the average annual cost of maintenance from the estimated saving of $13,366.07 there

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remains a balance of $11,866.07, which, on a loan of a 3 per cent return upon invested capital and 1 per cent reserved as a sinking fund, the capital represented amounts to $296,651.75. No consideration has been given herein to the probable increase in the commerce of Westchester Creek mentioned in the last subparagraph of paragraph 7 of the preliminary report, to the probable increase resulting from an enlarged channel, or to the increased traffic expected upon the opening of the State Barge Canal. Therefore, it would appear to be justifiable to expend the sum of $296,651.75 in further improvement of the creek.

9. The act of March 4, 1913, directs that an examination of Westchester Creek be made with a view to providing a channel width of 150 feet. The estimated cost of such a channel is as follows:

Rock excavation	$54,000
Dredging	287,000
Engineering and contingencies	34,000
Total	375,000

This total exceeds by about $79,000 the amount given in paragraph 8 as the amount which it would appear to be justifiable to expend in further improvement. The excavation of a channel to a width of 150 feet is therefore not recommended.

10. Due to the character of the waterway, the wharves are generally built along the bulkhead line on each bank so that to provide an adequate channel for vessels to lie at these wharves while transferring cargo, and at the same time provide a fairway for vessels to pass, and also to provide space for turning, a width of 125 feet at both Unionport and Westchester is recommended for adoption. Between these points and below Unionport to the East River, a width of 100 feet with widening at the bends is deemed sufficient. While the depth of 10 feet at mean low water is not sufficient to make possible the navigation of the creek at all stages of the tide by the majority of the vessels using this waterway, investigation shows that the additional saving to commercial interests of the locality would probably not be sufficient at this time to warrant the expenditure of funds to the extent required in order to secure a deeper channel. The estimated cost of the channel described in this paragraph and in paragraph 11, is as follows:

Rock excavation	$45,000
Dredging	219,800
Engineering and contingencies	26,200
Total	291,000

11. The estimated cost of a channel, which will fairly meet the requirements of navigation for some time to come, is thus about $5,600 less than has been stated in paragraph 8 as the amount which can be profitably expended in improvement. It is my opinion, therefore, that Westchester Creek is worthy of improvement by the United States at a cost of $291,000, and it is accordingly recommended that the project for its improvement be enlarged by excavating a channel to extend from deep water in the East River, N. Y., to the head of navigation at the fixed bridge at Main Street (Fort Schuyler Road) in Westchester, this channel to be 10 feet deep at mean low water and 100 feet bottom width up to a point 1,000 feet

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below the bridge at East One hundred and seventy-seventh Street in Unionport; thence a bottom width of 125 feet to a point 1,200 feet above this bridge; thence 100 feet bottom width to a point 1,100 feet below the fixed bridge at Main Street in Westchester; and thence 125 feet bottom width to a point 35 feet below the south line of the fixed bridge and causeway at Main Street (Fort Schuyler Road) in Westchester; all at an estimated cost of $291,000, and an average annual expenditure for maintenance of $1,500.

12. It is highly important to the commercial interests of both Unionport and Westchester that the deepening and widening of the channel at these places be accomplished at an early date. The cost of this work is estimated at $120,000. It is recommended therefore that if the project is adopted, this work be completed within two years after the date of adoption and that the whole improvement be completed within six years after said date; the adoption of this project, as a whole, to be made subject to the requirement that the necessary right of way across upland lying between harbor lines, as established by the Secretary of War May 2, 1914, be granted free of cost to the United States. An act making the appropriation for this work should authorize the expenditure of such amount as may be necessary for maintaining the existing channel excavated under the project of June 25, 1910, pending the completion of the larger project.

13. There are no questions of terminal and transfer facilities, development of water power, or other subjects connected with the proposed improvement that can be utilized to lessen the cost of the improvement to the United States.

W. M. BLACK,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors on survey, see p. 3.]

SUPPLEMENTAL REPORT ON WESTCHESTER CREEK, N. Y.

UNITED STATES ENGINEER OFFICE,
First District, New York City, July 26, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Supplemental report on survey of Westchester Creek.

1. In compliance with department letter of July 20, 1915, the following additional estimates for the improvement of Westchester Creek are furnished, as requested by the Board of Engineers for Rivers and Harbors under date of July 16, 1915:

(a) For a channel 8 feet deep and 100 feet wide, suitably widened at bends:	
Rock, 1,300 cubic yards, place measurement, at $12	$15,600
Other material, 341,000 cubic yards, scow measurement, at 35 cents	119,350
Engineering and contingencies	13,450
Total	148,400
(b) For a channel 10 feet deep and 100 feet wide, suitably widened at bends:	
Rock, 3,800 cubic yards, place measurement, at $10	38,000
Other material, 540,000 cubic yards, scow measurement, at 28 cents	151,200
Engineering and contingencies	18,800
Total	208,000

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2. In this connection attention is invited to the fact that up completion of the New York State Barge Canals the standa of barges used in this section will undoubtedly be that for the canals have been designed, viz, those of 12 feet draft. Sin commerce on the small streams around New York City is carr almost exclusively by barges, the channel dimensions of those st should be based upon the size of barges using the canals.

3. Where the material through which the waterways pass full depth of 12 feet should be given to the channel. Where material or rock is encountered, the cost of a channel with th desirable dimensions is at times too great to be justified by the ent commerce and a compromise must be adopted.

4. In considering the proposed improvement of Westchester C close attention was given to these conditions. The cost of a ch 12 feet deep was evidently unwarrantably great. It was found with a channel 10 feet deep, the cost of which appeared justi navigation by most of the craft now using the waterway wou possible at all stages of the tide and that barges of 12 feet l draft could enter on a rising tide and be sufficiently unloaded b the next low water so that their draft would not then exceed 10 It was further found that this could not be done in a channel feet depth.

5. The cost of transportation by barges is dependent large towage charges. Towage by small tugs is disproportionately expensive than by larger ones, the effective power developed re to the expense of operation being considerably higher for the s tugs. Moreover, while small tugs are fairly effective in sm water, they can not hold a tow safely under storms. The dra tugs should therefore be given consideration, as well as the dra barges, in considering transportation charges with various width depths.

6. In view of all the conditions affecting this waterway the a tion of a depth less than 10 feet for its further improvement i recommended.

W. M. Black,
Colonel, Corps of Enginee

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 375.

PULTNEYVILLE HARBOR, N. Y.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON REEXAMINATION OF PULTNEYVILLE HARBOR, N. Y.

DECEMBER 13, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 9, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated 6th instant, together with copy of a report from Maj. L. V. Frazier, Corps of Engineers, dated September 30, 1915, with map, on reexamination of Pultneyville Harbor, N. Y., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 6, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Reexamination of Pultneyville Harbor, N. Y.

1. Under authority contained in section 14 of the river and harbor act approved March 4, 1915, there is submitted herewith for transmission to Congress report dated September 30, 1915, with map, by Maj. L. V. Frazier, Corps of Engineers, relative to the project for improvement of Pultneyville Harbor, N. Y.

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2. This harbor is at the mouth of Salmon Creek, which empties into Lake Ontario, 22 miles east of Charlotte Harbor, N. Y. The project for its improvement, adopted in 1871, provided for protecting the approach to the creek by building two piers in the lake of timber cribs filled with stone, and dredging a channel 10 feet deep at low water from the 10-foot curve in the lake to the mouth of the creek, at a total estimated cost of $59,000, which was later increased to $71,000. The structures were completed and the channel dredged to a depth of 8 feet. No work has been done by the United States since 1908. Pultneyville is a village of less than 300 inhabitants. The district officer reports that it has no commerce at the present time and has had practically none for the last 15 years. There is no prospect of future development of commerce and he recommends that the project be abandoned. The division engineer and the Board of Engineers for Rivers and Harbors concur in this opinion.

3. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore recommend that legislation be enacted authorizing the abandonment of the project for improvement of Pultneyville Harbor, N. Y.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
October 13, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. The following report on Pultneyville Harbor, N. Y., is submitted under authority of that portion of section 14 of the act of March 4, 1915, which reads "and the Chief of Engineers is directed to make a report upon any other projects, river or harbor, the further improvement of which under present conditions is undesirable, or in which modifications of the plans or projects should be made."

2. This harbor is situated on Lake Ontario, at the mouth of Salmon Creek, 22 miles east of Charlotte Harbor. Work has been carried on from time to time since 1871, when a project was undertaken to provide an entrance channel 10 feet deep, protected by jetties. The jetties were built, but it was found impracticable to obtain a greater depth than 8 feet, and even this has not been maintained. The available depth has ranged from less than 1 foot up to 8 or 10 feet. No work has been done since 1908. The total expenditures to June 30, 1914, have been $83,396.99.

3. Pultneyville is a village of less than 300 inhabitants. The commerce reported prior to 1910, was insignificant, since which time there has been none, and the district officer reports that there is none in prospect. He is therefore of opinion that the locality is unworthy of improvement and that the project should be abandoned by the United States. The division engineer concurs with the district officer.

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4. In view of the absence of any commerce, either present or prospective, the further continuance of this project does not appear to be justified. The board therefore concurs with the district officer and the division engineer, and recommends that legislation be enacted authorizing the abandonment of the project for Pultneyville Harbor, N. Y.

For the board:

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior member present.

REEXAMINATION OF PULTNEYVILLE HARBOR, N. Y.

UNITED STATES ENGINEER OFFICE,
Buffalo, N. Y., September 30, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Examination of Pultneyville Harbor, N. Y., with a view to modification or abandonment of project.

1. In compliance with instructions from the Office of the Chief of Engineers, dated May 3, 1915, I submit report as follows on examination of harbor at Pultneyville, N. Y., with a view to the modification or abandonment of the project.

2. Pultneyville Harbor is located on Lake Ontario at the mouth of Salmon Creek about 22 miles east of Charlotte Harbor. The locality is shown in general on United States Lake Survey Chart No. 23, Coast Chart No. 3, Lake Ontario, and in detail on the map herewith.

3. When the United States first undertook the improvement of this harbor in 1871, $25,000 to $35,000 had been expended by private enterprise in building a pier and in dredging. From the north side of the mouth of the creek a timber-crib pier 171 feet long projected about 80 feet from shore. There was a pool about 900 feet long, 40 to 60 feet wide and 6 to 10 feet deep at the mouth of the creek, which ended abruptly in a small brook at the head of the pool (see map, Annual Report Chief of Engineers, 1894, p. 2462).

4. The original project for improvement by the United States pursuant to the first appropriation by river and harbor act of July 11, 1870, contemplated protecting the approach to the creek by building two timber-crib piers in the lake and dredging a channel 10 feet deep at low water between them, from the 10-foot curve in the lake to the pool in the creek at an estimated cost of $59,000. In 1875 the material to be dredged was found to be so hard that the estimated cost was increased to $71,000. The piers were completed in 1884—east pier 572 feet long and west pier 910 feet long—and dredging was done at various times until 1900 when the attempt to secure the 10-foot depth was abandoned on account of the difficult dredging.

5. The channel was found to be very unstable and rapidly filled with sand and gravel, particularly at the mouth of the creek. In order to prevent this filling of the channel a bulkhead 200 feet long of Wakefield sheet piling was constructed in 1891–2 at the east side of the creek outlet and dredging was done thereafter from time to time and a channel 8 feet deep secured.

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6. In 1900 the abandonment of the project was recommended the district officer, by statement in the annual report of the Chief Engineers for 1901, as follows:

The channel is very unstable, rapidly filling with sand and gravel. In the ann report for 1895, page 420, the channel depth is reported as "about 10 feet at low wi in the lake"; in July, 1896, it was 6 feet, and in October, 1896, the depth at water was barely 4 feet. In March, 1899, the depth was three-tenths of a foo extreme low water.

No money is asked for for this harbor, and it is recommended that it be abando as a harbor to be maintained by the United States.

7. No further work was done until after the passage of the ri and harbor act of March 2, 1907, which appropriated $6,000 for "c tinuing improvement and for maintenance."

8. Under this appropriation, repairs to the piers and dredging a channel 14 feet wide and 8 feet deep at low water were comple in 1908, since which time no work has been done.

No soundings have been taken in the channel since 1908, but it known to be of sufficient depth to meet the requirements of the sm motor boats visiting the harbor during the summer excursion seas

9. The total amount expended by the General Government on t improvement of the harbor to the present time is $83,810.73, and t balance of funds available is $1,072.56.

10. Pultneyville is a village of less than 300 inhabitants. It h no commerce at the present time and has had practically none over 15 years. The following table shows commercial statistics the past 9 years as reported in the annual reports of the Chief Engineers:

Calendar year.	Arrivals and departures.	Freight received (tons).	Freigl shippe
1906	4	130	None.
1907	4	77	None.
1908	4	99	None.
1909	Commerce insignificant		
1910	Commerce insignificant		
1911	None	None.	None.
1912	None	None.	None.
1913	None	None.	None.
1914	None	None.	None.

11. The small commerce Pultneyville had in the past consist largely of posts, shingles, brick, etc., imported in such quantities were consumed within easy hauling distance over country roads.

12. There is no prospect of future development of commerce this port. There are no terminal facilities and the nearest railro and trolley lines are about 4 miles distant.

13. Charlotte Harbor is about 22 miles to the west of Pultneyvi and the harbor at Great Sodus Bay about 10 miles to the east, bo of them having railroad connections.

14. In view of the lack of commerce, present and prospective, am of the opinion that Pultneyville Harbor is unworthy of a further expenditure of funds for improvement or maintenance, a its abandonment as a harbor to be maintained by the United Sta is recommended.

15. No question of water-power development enters into t improvement of this harbor.

L. V. FRAZIER,
Major, Corps of Engineers.

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[First indorsement.]

OFFICE DIVISION ENGINEER LAKES DIVISION,
Buffalo, N. Y., October 1, 1915.

To the CHIEF OF ENGINEERS:

Forwarded, concurring in the opinion and recommendation of the district officer as expressed in paragraph 14 of his report.

J. G. WARREN,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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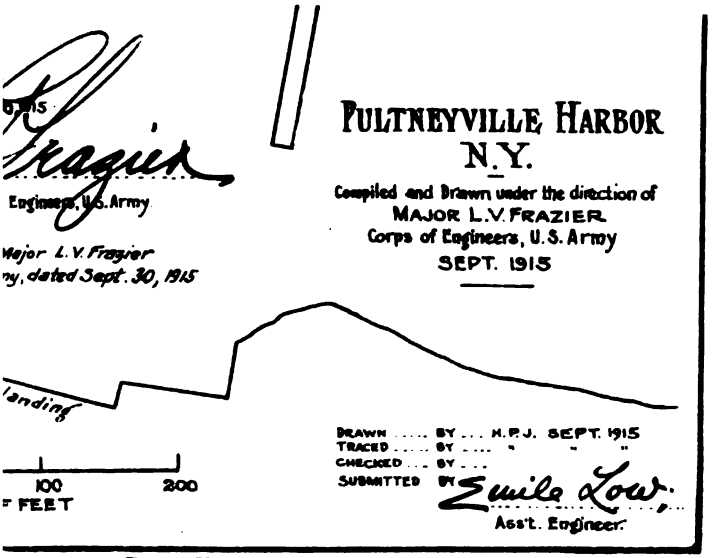

House Doc. No. 375 ; 64th Cong., 1st Sess.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 376.

HARBOR OF REFUGE AT TUXIS ISLAND, CONN.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF TUXIS ISLAND, CONN., WITH A VIEW TO THE CONSTRUCTION OF A SUITABLE HARBOR OF REFUGE.

DECEMBER 13, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 9, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated 6th instant, together with copy of a report from Maj. G. B. Pillsbury, Corps of Engineers, dated July 19, 1915, on preliminary examination for harbor of refuge at Tuxis Island, Conn., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 6, 1915.

From: The Chief of Engineers United States Army.
To: The Secretary of War.
Subject: Preliminary examination for harbor of refuge at Tuxis Island, Conn.

1. There is submitted herewith for transmission to Congress report dated July 19, 1915, by Maj. G. B. Pillsbury, Corps of Engineers, on preliminary examination authorized by the river and harbor act

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approved March 4, 1915, of Tuxis Island, Conn., with a view to the construction of a suitable harbor of refuge.

2. Tuxis Island is a small, rocky island lying about 300 yards off the beach opposite the town of Madison, Conn. It is 17 miles to the east of New Haven Harbor and 7 miles to the west of Duck Island Harbor, both of which are well-sheltered harbors. Small vessels can also find shelter at the Thimble Islands, about midway between Tuxis Island and New Haven. A harbor at Tuxis Island would be difficult of access and of insufficient depth and area for general commercial use, and in view of the proximity of suitable harbors of refuge, the need for such a harbor at this place is not apparent. In the opinion of the district officer, the construction of a harbor of refuge at Tuxis Island is not advisable at the present time. The division engineer concurs in this opinion.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated September 14, 1915, concurring in the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Tuxis Island, Conn., with a view to the construction of a suitable harbor of refuge is not deemed advisable at the present time.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 14, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's report on preliminary examination of Tuxis Island, Conn., with a view to the construction of a suitable harbor of refuge, called for by the act of March 4, 1915.

2. Tuxis Island lies about 300 yards off the north shore of Long Island Sound, at the town of Madison, Conn., 17 miles east of New Haven Harbor and 7 miles west of Duck Island Harbor. There is a small partially sheltered area 9 to 12 feet deep under the western end of the island, but outlying reefs and rocks render approach thereto somewhat dangerous. The range of tide is 4.4 feet.

3. The improvement desired is a breakwater extending westward from the island to afford a sheltered area between the island and the shore. The arguments advanced in favor of the improvement are that it would afford a harbor of refuge for passing vessels and for the private yachts and pleasure boats of local summer residents, the exposure at Madison being too great for this class of vessels.

4. The district officer finds that this location is unsuited for a harbor of refuge for several reasons, some of which are insufficient

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epth, inadequate area, and unsafe approach; he states, moreover, hat even were the locality suitable, the need for such a harbor is not pparent. He therefore expresses the opinion, in which the division ngineer concurs, that the construction of a harbor of refuge at Tuxis sland is not advisable at this time.

5. Interested parties were informed of the unfavorable report of he district officer and given an opportunity of submitting their iews, but no communications on the subject have been received by he board.

6. The conditions at Tuxis Island are not favorable for a harbor of efuge, and, moreover, the commerce of Long Island Sound does not equire an additional harbor of refuge in this vicinity. It would ppear feasible to construct a small sheltered harbor suitable for cal pleasure boats, but such a harbor would be of little value to neral commerce and navigation, and if constructed at all it should ot be at Federal expense. In view of the foregoing, the board eports, in concurrence with the views of the district officer and the ivision engineer, that it is not advisable for the United States to nstruct a harbor of refuge at Tuxis Island, Conn.

7. In compliance with law, the board reports that there are no uestions of terminal facilities, water power, or other related subjects aving any material bearing upon the improvement of navigation at is locality.

For the board:

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

ELIMINARY EXAMINATION FOR HARBOR OF REFUGE AT TUXIS ISLAND, CONN.

UNITED STATES ENGINEER OFFICE,
New London, Conn., July 19, 1915.

rom: The District Engineer Officer.
o: The Chief of Engineers, United States Army
(Through the Division Engineer).
ubject: Preliminary examination of Tuxis Island, Conn.

1. The following report on the preliminary examination of Tuxis sland, Conn., with a view to the construction of a suitable harbor r refuge, is submitted in compliance with the river and harbor act pproved March 4, 1915.

2. Tuxis Island is a small rocky island lying about 300 yards off he beach, on the north shore of Long Island Sound, at the town of adison, Conn. It is 17 miles to the east of New Haven Harbor and miles to the west of Duck Island Harbor, these being the nearest rge and well-sheltered harbors in the vicinity. Small vessels can, owever, find shelter at the Thimble Islands, about midway between uxis Island and New Haven, when occasion arises.

3. From the eastern end of the island a shoal with a very little ater over it at low tide extends inward to the shore. Inside of the estern end of the island the depths range from 9 to 12 feet at mean w water, the area having these depths being somewhat greater than

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that indicated by the United States Coast Survey chart of the locality (No. 259). A short distance to the west of the island the depth at mean low water increases to 14 and 16 feet. It is reported that the bottom inside of and to the west of the island is soft, affording good holding ground, and is unobstructed by rocks. There are, however, rocks in the shoal water farther inshore. The mean range of tide as determined in 1882 is 4.4 feet.

4. A long reef of scattered rocks, known as Madison Reef, lies somewhat less than a mile off the island and extends for about 2 miles in a direction generally parallel to the shore; to the west of Madison Reef are outlying reefs to Guilford, while to the east of Tuxis Island there are a number of dangerous outlying rocks. From no direction, in fact, is there a clear approach to Tuxis Island 1,000 yards in width. Faulkners Island, with its surrounding shoals, lies 4½ miles to the southwest.

5. A substantial stone wharf, known as the west wharf, to distinguish it from another structure about a mile to the east, was constructed by the town of Madison, many years ago, just northwest of Tuxis Island, and has subsequently been maintained in good condition. The depth alongside this wharf is sufficient for comparatively light draft vessels only. In former days a large amount of produce was shipped from this wharf to New York in small sailing vessels, but this commerce has disappeared, the produce now exported being shipped by rail.

6. There have been no previous examinations of the locality directed to the specific object of the present examination. Under authority of the river and harbor act of March 3, 1881, a survey was made of Madison Harbor, and plans presented for the construction of breakwaters to form a harbor a short distance to the east of Tuxis Island, but in no way connected to the island, at an estimated cost of $285,000. The plans were submitted without recommendation as to the worthiness of the improvement, but with the comment that the plans, if carried into effect, would "afford all local protection asked for, and serve the needs of such general commerce as [might] be likely to use it" (S. Ex. Doc. No. 84, 47th Cong., 1st sess., Annual Report for 1882, pp. 627–629). A subsequent report, authorized by the river and harbor act of August 2, 1882, was directed to the protection of the beach in the vicinity of the east wharf (Annual Report for 1884, p. 685). Neither of these improvements have been authorized by Congress.

7. A duly advertised public hearing on the proposed improvement was held at Madison on June 28, 1915. The record [1] of the hearing is appended. The improvement desired, as there evinced and as previous investigation had indicated, is a breakwater extending westward from Tuxis Island, to afford a sheltered area between the island and the shore.

8. The arguments advanced at the hearing in support of the worthiness of the improvement were, in general, that the harbor would afford a needed refuge in stress of weather for the passing vessels in Long Island Sound, both the larger craft engaged in commerce and the yachts and power boats cruising for pleasure; and that it would afford a sheltered anchorage in which a considerable number of summer residents of the locality could maintain yachts and power

[1] Not printed.

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boats in safety. The locality is so exposed that these vessels can not be kept at Madison at the present time. While particular stress was laid on the value of the harbor as a refuge for commercial vessels, it was very apparent that the desire for the improvement lay in the anticipated benefit to the locality. Although notice of the hearing was sent to the firms interested in the commercial navigation of the Sound, no representative of these interests attended the hearing, nor has any person connected with commercial navigation manifested at any time any interest whatever in a harbor at Tuxis Island.

9. A consideration of the requirements that should be met by a harbor of refuge suitable for commercial navigation of the character of that using Long Island Sound at the present time, shows that the site at Tuxis Island is unsuitable for the purpose from a number of points of view. The mean low water depth in such a harbor should be in the vicinity of 18 feet, as a minimum. The depth available at Tuxis Island falls far short of this. Even were the depth sufficient, the area necessary for the accommodation of the long tows, in which a great part of the commerce is carried, is far greater than that afforded by the breakwater desired. A harbor of refuge should above all else be safe of approach in thick weather; while Tuxis Island is surrounded by dangerous reefs and ledges. Moreover, even were the locality suitable for the construction of a harbor of refuge, the need for such a harbor is not apparent. An excellent harbor of refuge has been constructed by the United States at Duck Island, but a few miles to the east. The relative positions of Faulkners Island, Tuxis Island, and Duck Island Harbor is such that even eastbound vessels, taking a course outside of the former, as would be dictated by common prudence in bad or threatening weather, would at all times be substantially as near to Duck Island Harbor as to Tuxis Island.

10. For small pleasure craft cruising in the Sound a harbor of refuge at Tuxis Island would undoubtedly be very convenient. As, however, the reach between the Thimble Islands to the west and Duck Island Harbor to the east is but about 15 miles in length, only small local boats should have any difficulty in reaching one of these shelters when bad weather sets in. Even if the safety of navigation of this character be a proper end for the expenditure of Federal funds, such expenditure does not appear to be called for in this instance.

11. To the immediate locality, by affording a local anchorage for pleasure craft and by attracting as summer residents owners of such boats, a harbor of refuge at Tuxis Island would have a very considerable value. This value may be considered sufficient to justify the expenditure of State or local funds in its construction. I see no benefit to the general public of the United States, however, that would justify the expenditure of Federal funds in meeting any part of the cost of such an improvement.

12. I am of the opinion, therefore, that the construction by the United States of a harbor of refuge at Tuxis Island, Conn., is not advisable at the present time, and I recommend that a survey of the locality with this end in view be not undertaken.

13. No questions of water power or other subjects connected with the interests of navigation are connected with this examination.

G. B. PILLSBURY,
Major, Corps of Engineers.

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First indorsement.

THE DIVISION ENGINEER, NORTHEAST DIVISION,
New York City, July 21, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

Forwarded, concurring in the views and recommendation of the district engineer officer.

FREDERIC V. ABBOT,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 377.

BAYOU FOURES (FORET), LA.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF BAYOU FOURES (FORET), CAMERON PARISH, LA.

DECEMBER 13, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 9, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated 6th instant, together with copy of a report from Maj. Edward H. Schulz, Corps of Engineers, dated June 30, 1915, with map, on preliminary examination of Bayou Foures (Foret), Cameron Parish, La., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 6, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Bayou Foures (Foret), La.

1. There is submitted herewith for transmission to Congress report dated June 30, 1915, with map, by Maj. Edward H Schulz, Corps of Engineers, on preliminary examination authorized by the river and

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harbor act approved March 4, 1915, of Bayou Foures (Foret), Cameron Parish, La.

2. Bayou Foures, locally known as Bayou Foret, is a tributary of Calcasieu Lake, into which it flows at a point about 9 miles northeast of Cameron, La. It can be navigated by launches for a distance of about 5 miles from the mouth, and by shallow-draft flats for 1 mile farther. Beyond this point is an area of high land, known as Creole Ridge, having a population of perhaps 1,500, and extending from Calcasieu River to Mermentau River. The improvement apparently desired is the deepening and widening of the bayou, and the construction of a canal about 20 or 25 feet wide and 6 to 8 feet deep from the bayou to Creole Ridge. The dredging of a channel into Calcasieu Lake at the entrance would also be necessary. The district officer states that the improvement would be expensive to make and to maintain, and having in mind the small population and limited products of the tributary area he is of opinion that no expenditure by the Federal Government is advisable. The division engineer concurs in this opinion.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated September 15, 1915, concurring in the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Bayou Foures, Cameron Parish, La., is not deemed advisable at the present time.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 15, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's report on preliminary examination of Bayou Foures, Cameron Parish, La., called for by the act of March 4, 1915.

2. This stream, locally known as Bayou Foret, is a tributary of Calcasieu Lake, into which it flows at a point about 9 miles northeast of Cameron, La. It can be navigated by launches for a distance of about 5 miles from the mouth, and by small shallow draft flats for 1 mile farther. The remainder of the distance to Creole Ridge, about 1½ miles, is made by teams. Creole Ridge, having a population of perhaps 1,500, is an area of high land about 1 to 2 miles wide, extending from Calcasieu River to Mermentau River. The improvement apparently desired is the deepening and widening of the bayou, and the construction of a canal about 20 or 25 feet wide and 6 to 8 feet deep from the bayou to Creole Ridge. It is claimed that this improvement would help the people to market their

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crops and would save from 10 to 15 miles hauling, which is now required in shipping by way of Cameron. The improvement desired, however, would be expensive to make and to maintain, and having in mind the small population and products of the tributary area, the district officer reaches the conclusion that no expenditure by the Federal Government is advisable at this time. The division engineer concurs in this view.

3. Interested parties were informed of the unfavorable report of the district officer and invited to submit statements to the board, but no communications on this subject have been received.

4. Bayou Foures is a small stream about 6 miles in length and is navigable only by launches and flatboats. To provide useful navigation to Creole Ridge, as desired by local interests, would require the deepening and widening of the bayou, dredging a channel into Calcasieu Lake at the entrance, and constructing an artificial canal at the upper end. This work would be costly and portions of the waterway would be difficult to maintain. In view of the small prospective commerce, as compared with the probable cost of improvement and maintenance, the Board concurs with the district officer and the division engineer in the opinion that it is not advisable for the United States to undertake the improvement of Bayou Foures, La.

5. In compliance with law, the Board reports that there are no questions of terminal facilities, water power, or other related subjects having any material bearing upon the improvement of navigation at this locality.

For the board:

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

PRELIMINARY EXAMINATION OF BAYOU FOURES, LA.

UNITED STATES ENGINEER OFFICE,
New Orleans, La., June 30, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
(Through the Division Engineer).
Subject: Preliminary examination of Bayou Foures (Foret), La.

1. The following report on preliminary examination of Bayou Foures (Foret), with a view to its improvement, is submitted under the provisions of the river and harbor act of March 4, 1915, and in compliance with department instructions of March 15, 1915. An examination of this stream was made on May 17, 1915. The local name is Bayou "Foret."

2. Two maps are submitted herewith. Sheet No. 1 shows the general location of the stream with respect to other waterways of the vicinity. Sheet No. 2 [1] shows the meander of the stream on a larger scale, together with the approximate depths of water.

3. This stream is a tributary of Calcasieu Lake, into which it flows at a point about 9 miles northeast of Cameron, La. The mouth is

[1] Not printed.

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about 16½ miles from eastern end of Sabine-Calcasieu Waterwa about 35½ miles from the city of Lake Charles, La., and about 1 miles from the mouth of Calcasieu River (Gulf of Mexico). I source is about 1½ miles north of the central portion of Creole Rid and about 5 miles west of Creole Settlement. Creole Ridge is abo 1 to 2 miles wide and extends from Calcasieu River to the Mermenta River.

4. The reconnoissance of this stream extended from Creole Rid to Calcasieu Lake, and it was found that launches can be used for distance of about 5 miles (A–B), and small shallow-draft flats fo 1 mile farther (B–C). The balance of distance to Creole Ridge (C–D about 1½ miles, is made by teams.

5. Beginning at the mouth, for the first mile, the stream is abou 80 feet wide and 7 to 9 feet deep through marsh.

Mile 1 to mile 2.—Stream is about 100 feet wide and 7 feet dee through marsh.

Mile 2 to mile 3.—Stream spreads out into a lake, Little Bay, fo about two-thirds of the distance; 500 feet wide and 6 feet deep throug the marsh.

Mile 3 to mile 4.—Stream is about 200 feet wide with depth vary ing from 6 feet to 3 feet, where said stream again expands into a lake Big Bay, which is about 800 feet wide through marsh.

Mile 4 to mile 5.—Stream is through Big Bay, about 800 feet wid and about 1 foot deep through marsh.

Mile 5 to Mile 6.—Stream narrows down to about 40 feet wide with a depth of less than 1 foot through marsh

Mile 6 to Mile 7.—Partly through a small shallow lake, and thence over marsh land to Creole Ridge.

6. *Commerce.*—The area of Cameron Parish is about 1,600 square miles, and the total population about 4,500, of which perhaps 1,500 live on Creole Ridge. The assessments of the parish are over $1,300,000. The inhabitants along Creole Ridge are chiefly engaged in agriculture and stock raising. The principal products are cotton, corn, potatoes, truck and pecans. There are three cotton gins on the ridge, each of which gin from 200 to 300 bales of cotton per season. The principal method of transporting these products to market is to haul them over land for an average distance of 14 miles to Cameron, and thence to Lake Charles, La., by boats. During the winter months the roads become impassable even for light wagons. It is stated that two small launches use Bayou Foures and carry on such trade as is practicable.

7. It is estimated that the following commerce could be handled on this bayou if the same were improved from A to B:

	Pounds.
Cotton, about 600 bales, at 500 pounds	300,000
Cotton seed, about 200 bales, at 1,000 pounds	200,000
Cattle, about 1,500 head	600,000
Miscellaneous	50,000
Total	1,150,000

Or about 575 tons.

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8. In regard to the desires of local interests, the only definite information received was from Mr. Lloyd Vaughan, president of the police jury of Cameron Parish, as follows:

The nature of the improvement desired is this: That the people want the Government to deepen and widen the said Bayou Foret and make a canal from where said bayou stops to the high land, called Creole Ridge, about 20 or 25 feet wide and from 6 to 8 feet deep, said canal to be about 3 miles long. With the bayou opened up and the canal as above stated, it would help the neighborhood of 1,500 people to market their crops and would be a saving of from 10 to 15 miles hauling.

9. The following work would have to be done in order to secure a channel 30-foot bottom width and 5-foot depth, at mean low gulf, with side slopes 1 on 1:

(A) From Creole Ridge to sixth mile, for about 8,000 feet solid cut, average elevation ÷ 2.8.

(B) From sixth to fourth mile, for about 10,000 feet average depth below mean low gulf 1.7 feet. The mud flats through this lake will make the maintenance of channel rather difficult.

(C) From fourth to second mile for about 2,000 feet to be dredged; average cut 1 foot,

(D) From second to 0 mile, no dredging will be required.

(E) From 0 mile out in Calcasieu Lake for about 3,000 feet, the mean depth is about 3 feet and would require dredging, which channel would be very hard to maintain on account of the soft shifting bottoms of these lakes.

10. The only interests that would be served by any improvement of Bayou Foret would be the people living in the vicinity; and while water transportation would greatly relieve their condition, it is not believed that the present population and products warrant any expenditure on the part of the Federal Government at this time. It is therefore recommended that no further survey and report be made.

EDWARD H. SCHULZ,
Major, Corps of Engineers.

[First indorsement.]

OFFICE OF DIVISION ENGINEERS, GULF DIVISION,
New Orleans, La., August 14, 1915.

To the CHIEF OF ENGINEERS.

1. Forwarded.

2. In view of the small prospective commerce on this bayou, if improved, as compared with the probable cost of improvement and maintenance, the district officer's conclusion and recommendation are concurred in.

J. C. SANFORD,
Colonel, Corps of Engineers,
Division Engineer.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 390.

RONDOUT HARBOR, N. Y

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORTS ON PRELIMINARY EXAMINATION AND SURVEY OF RONDOUT HARBOR, N. Y., FROM THE HUDSON RIVER TO THE HEAD OF NAVIGATION.

DECEMBER 14, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustrations.

WAR DEPARTMENT,
Washington, December 13, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated May 19, 1915, together with copies of reports from Col. W. M. Black, Corps of Engineers, dated July 21, 1913, and October 19, 1914, with maps, on preliminary examination and survey, respectively, of Rondout Harbor, N. Y., made by him in compliance with the provisions of the river and harbor act approved March 4, 1913.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, May 19, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination and survey of Rondout Harbor, N. Y.

1. There are submitted herewith for transmission to Congress reports dated July 21, 1913, and October 19, 1914, with maps, by

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Col. W. M. Black, Corps of Engineers, on preliminary examination and survey, respectively, of Rondout Harbor, N. Y., from the Hudson River to the head of navigation, authorized by the river and harbor act approved March 4, 1913.

2. Rondout Harbor is at the mouth of Rondout Creek, on the west bank of the Hudson River, 90 miles north of New York City and 55 miles from Albany. It is navigable for a distance of about 4 miles from the mouth. On the north shore for about 3 miles west from the entrance is the town of Kingston, adjacent to it is the village of Wilbur, and on the south bank are the villages of Sleightsboro and South Rondout. The village of Eddyville is at the head of navigation.

3. The original and existing project, which was completed in 1880, and has since been maintained, provides for a channel across the mud flats at the mouth of the creek about 3,000 feet long, 14 feet deep at mean low water, and 100 feet wide, by dredging and dike construction. Rondout Harbor supports a considerable commerce and is the home port of towing vessels which move the bulk of the freight traffic of the Hudson River. In view of the development since the present project was adopted, the district officer, who is also the division engineer, believes that a new and larger project is justifiable. He presents with favorable recommendation a project which provides for a channel 18 feet deep and 200 feet wide up to the West Shore Railroad bridge and 12 feet deep and 100 feet wide from that point to the coal wharf just below the iron bridge at Eddyville, with some dike work to be used in aid of future maintenance and for the retention of dredged material. The total estimated cost of this project is $324,000, of which he recommends that work estimated to cost $252,000 be first undertaken, leaving the remainder to be accomplished when required in the future. In view of local benefits to be expected from the improvement, the district officer believes that a cash contribution of $23,000 should be made by the locality and free privilege granted to the United States for the deposit of dredged material.

4. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated April 28, 1915. The board concurs with the district officer in the view that some additional facilities are desirable, but it believes that a channel 15 feet deep and 200 feet wide up to Broadway, and 12 feet deep and 100 feet wide thence to Eddyville, at an estimated cost of $58,170, will adequately meet the needs of commerce and navigation. The board therefore recommends the adoption of this lesser project, contingent upon local interests providing free bulkheaded dumping grounds before the work is undertaken.

5. After due consideration of the above-mentioned reports, I concur in the views of the Board of Engineers for Rivers and Harbors and therefore report that the further improvement of Rondout Harbor, N. Y., from the Hudson River to the head of navigation, is deemed advisable to the extent of providing a channel 15 feet deep at mean low water and 200 feet wide up to Broadway, and 12 feet deep and 100 feet wide thence to Eddyville, at an estimated cost of $58,170 for first construction and $4,000 annually for maintenance, provided that local interests will furnish satisfactory bulkheaded dumping grounds, free of cost to the United States, before the work

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is undertaken. The whole amount of the estimate should be provided in one appropriation.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS ON SURVEY.

[Fourth indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
April 28, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's reports of preliminary examination and survey of Rondout Harbor, N. Y., from the Hudson River to the head of navigation, submitted under authority of the act of March 4, 1913.

2. This harbor is at the mouth of Rondout Creek, on the west shore of the Hudson River, 90 miles north of New York City. The total navigable length of the creek is nearly 4 miles.

3. The existing project provides for a channel across the flats at the mouth of the creek about 3,000 feet long, 14 feet deep at mean low water, and 100 feet wide, at an estimated cost of $172,500. The project was completed in 1880. The total expenditures have been about $160,000, of which amount about $70,000 was for maintenance. The mean range of tide is approximately 3.9 feet.

4. The town of Kingston-Rondout is located at the mouth of the creek. It was at an early date of great commercial importance as the tidewater outlet of the now abandoned Delaware & Hudson Canal. The population is about 29,000, with a tributary population of about 20,000 more.

5. At mean low water the river is navigable for vessels drawing 13 feet, to the vicinity of the chain ferry connecting Rondout with Sleightsboro. Some of the passenger and freight boats, as well as tugs, draw as much as 14 feet, and therefore dependence to some extent must be placed upon the tides, which causes some delay in the operation of the largest boats. Rondout Creek is used extensively as a winter harbor for Hudson River craft. There are three principal steamboat and towing companies doing business out of Rondout, having in service at this harbor some 35 passenger, freight, and tow boats.

6. The commerce is reported for 1912 as amounting to 583,775 tons, the principal items being 231,150 tons of coal and 175,000 tons of crushed stone, and the total value being about $3,000,000. Before the abandonment of the Delaware & Hudson Canal, about 1,000,000 tons of coal were handled here each year.

7. This harbor is the home of the Cornell Towing Co., which does the greater part of the towing business on the Hudson River. There are two general classes of tugs in use, deep-draft, high-powered tugs used on the lower river and light-draft tugs used on the upper river, the division point being at this harbor, where a change of vessels takes place.

8. The district officer analyzes the commercial and navigation conditions and their bearing upon existing and prospective needs, and

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concludes that additional navigation facilities are necessary to meet the present as well as future requirements of commerce. He believes that a depth of 18 feet at mean low water should be provided in that part of the harbor which is used by the deep-draft tugs from the lower river and 12 feet above that part to accommodate the lighter craft. He presents a project which provides for a channel 18 feet deep up to the West Shore Railroad bridge and 12 feet deep from that point to the coal wharf just below the iron bridge at Eddyville, the respective widths to be for the present 200 feet and 100 feet, some additional work to be done in the future as commercial and navigation developments may justify. The project also provides for some dike work to be used in aid of future maintenance, and for the retention of dredged material. The total cost of the project is $324,000 and $6,000 annually for maintenance, the amount required for present expenditure being $252,000. In view of local benefits to be expected from the improvement, the district officer believes that a cash contribution of $23,000 should be made by the locality and free privilege granted to the United States for the deposit of dredged material. Conditioned upon such cooperation, he reports the locality worthy of improvement by the United States to the extent outlined above.

9. A study of conditions at this harbor, as described by the district officer, led the board to the conclusion that some additional facilities were required to meet the needs of commerce and navigation. It was inclined to the opinion, however, that these might be adequately served by a project of somewhat less scope and at a corresponding lower cost. Interested parties were therefore invited to submit their views on this phase of the subject and the resulting correspondence indicates that while additional improvement is desired, local interests will generally be satisfied with a depth of 15 feet up to Broadway and 12 feet thence to Eddyville. The improvement on this basis, with respective widths of 200 feet and 100 feet, is estimated to cost $58,170. The board believes that the locality is worthy of improvement to this extent and that a channel of these dimensions will meet all reasonable demands for at least a number of years.

10. In carrying on the work it will be necessary to have a place of deposit for dredged material and some revetment or bulkhead work will be required to hold this material from flowing back into the channel. On account of the local benefit to be derived from the proposed improvement, it is believed that local interests should provide the necessary protected dumping grounds without cost to the United States. Contingent upon their providing such free bulkheaded dumping grounds before the work is undertaken, the board reports that, in its opinion, it is advisable for the United States to modify the existing project at Rondout Harbor so as to provide a channel 15 feet deep at mean low water and 200 feet wide from deep water in the Hudson up to Broadway and 12 feet deep and 100 feet wide thence to Eddyville at an estimated cost of $58,170 for first construction and $4,000 annually for maintenance. The whole amount of the estimate should be made available in one appropriation.

11. In compliance with law, the board reports that except as contemplated by the above recommendations there are no questions of terminal facilities, water power, or other subjects so related to the

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project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

PRELIMINARY EXAMINATION OF RONDOUT HARBOR, N. Y.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE, FIRST DISTRICT,
New York City, July 21, 1913.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Report on preliminary examination of Rondout Harbor, N. Y.

1. In compliance with instructions the following report is submitted on the preliminary examination of Rondout Harbor, N. Y., from the Hudson River to the head of navigation, ordered by the river and harbor act approved March 4, 1913.

I. THE EXAMINATION.

2. *Sources of general information.*—The more general information contained herein has been obtained from published maps and charts, from official records of the Engineer Department (the outer end of the harbor having been under improvement for a number of years), and by correspondence and consultation with the chamber of commerce and citizens of Kingston and Rondout. A general inspection of the locality was made by the engineer officer in local charge of the northern section of this district prior to the examination, in company with interested citizens. Attention is invited to the following inclosures herewith:

1–1e. Photographs [1] of water front, Rondout Creek.
2. Map [1] of Rondout Creek, Hudson River to Eddyville, N. Y.
3. Statement of president of Cornell Steamboat Co., relative to commerce and commercial statistics.
4. Photostat map [1] of the city of Kingston.

3. *Maps.*—The map [1] of Rondout Creek is based on surveys of the entrance to the harbor made in connection with past improvements, on city and county maps, and on a field reconnoissance made on June 10, 1913, by Willson Y. Stamper, United States surveyor.

4. *Reconnoissance.*—The field reconnoissance covered the territory west of earlier surveys, and included hydrography and the obtaining of information relative to topography and land ownership. Soundings were taken from a rowboat along the river channel to determine channel depths and widths, and the extent of shoals known and complained of. Ruling soundings only are shown on the map. Characteristic soundings were located roughly from adjoining topographical features and were plotted directly on the map at the time of sounding. All soundings are referred to a plane of mean low

[1] Not printed.

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water as adopted by the United States Engineer Department, prop allowance having been made for tide. A bench mark cut on the fa of the fourth step of the lighthouse and 7.4 feet above this plan was used as reference.

II. GEOGRAPHICAL DESCRIPTION.

5. *Rondout Harbor* is at the mouth of Rondout Creek, on the wes bank of the Hudson River, 90 miles north of New York City, and 5 miles from the city of Albany. In local parlance the term "Ron dout Harbor" is applied to that portion of Rondout Creek from th old village of Rondout to deep water in the Hudson River, a distanc of about 1 mile. However, the term will be applied herein to tha portion of Rondout Creek from the Hudson River to the tide lock o the Delaware & Hudson Canal at Eddyville, the head of navigation

6. *Rondout Creek* has its source in the timber-covered mountai group forming the Wittemberg chain, in Sullivan County, N. Y. about 30 miles southwest of the city of Kingston. It flows south easterly to Napanoch, where it encounters the foot of the Shawan gunk Ridge, turns abruptly to the northeast, and enters the Hudso at Rondout. Its watershed on the south is very restricted, and i is separated from the Wallkill River only by the narrow Shawangun Ridge. The Wallkill River, with its source in Sussex County, N. J. about 65 miles southwest from Kingston, empties into Rondou Creek about 5 miles above the mouth of the latter near Lefever Falls Together they form one of the most extensive river systems in south eastern New York, draining an area of 1,164 square miles.

7. *Falls and power.*—Notable waterfalls occur at Honk Falls (a Napanoch), Bull River, Grahamville, Lackawack, Port Hickson, High Falls, Lawrenceville, Lefever, and Eddyville. Water power is developed at Napanoch through five dams, utilizing a total of 115 feet fall. Bull River and Grahamville Falls develop power for saw-mills. Lackawack Falls runs an excelsior mill; Port Hickson Falls supplied water to the Delaware & Hudson Canal feeder, and High Falls has been abandoned. Lawrenceville Falls is used by the Lawrenceville Cement Co., Lefever is undeveloped, and Eddyville Falls feeds the Delaware & Hudson Canal. On the portion under examination, however, there is no water power, as the creek is a tidal stream.

8. *Kingston-Rondout*, at the mouth of Rondout Creek, was incorporated in 1872, and formerly enjoyed the largest river commerce of any port on the Hudson River, except Albany. Much of this was due to its being the tidewater outlet of the now abandoned Delaware & Hudson Canal, which followed the valley of the creek. At the present time it still holds an important position among the Hudson Valley commerce. The city lies partly on low land adjacent to the harbor and the north bank of Rondout Creek, and partly on the high plateau to the north and west. The Ulster & Delaware Railroad reaches the lower level with a track paralleling the wharves for a considerable distance. The passenger stations and principal freight yards of the three railroads which enter the city are on the upper level, where are located also the principal retail and wholesale districts, the greater part of the manufacturing plants, and most of the residences. The population is about 29,000.

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9. *Rondout Creek.*—The total navigable length of the creek from the entrance at the eastern end of the dikes to the head of navigation is nearly 4 miles. Kingston skirts the north shore for about 3 miles west from the entrance, and adjacent to it on the west is the village of Wilbur. On the south bank are the villages of Sleightsboro and South Rondout, distant 1 or 2 miles from the harbor entrance. The village of Eddyville is at the head of navigation. All along both banks are scattered industrial plants and dwellings, leaving on both banks considerable riparian land suitable for commercial development, lying between the creek and the base of the cliffs and hills. As shown by the photographs and map practically all of the commerce of the port is accommodated between the west end of the area heretofore under improvement and the head of tidewater navigation at Eddyville.

10. *Photographs.*[1]—A fair idea of the appearance and commercial character of the locality can be obtained from the photographs herewith, as inclosures 1 to 1e.

11. *Total population.*—The total population of the communities lying on the banks of the creek is estimated at 30,000, and Kingston is probably the distributing point for an agricultural community of about 20,000 people.

III. PHYSICAL CHARACTERISTICS OF STREAM.

12. *Tides and freshets.*—Rondout Creek in ordinary stages is a tidal stream for 3 miles above its mouth. In freshets its banks in the vicinity fill quickly, but the mountainous character of its watershed renders floods of short duration. Survey depths are referred to an assumed plane of mean low water[2] 7.4 feet below a bench mark on Rondout Lighthouse (see paragraph 4). This bench mark is 4.96 feet above mean sea level at Sandy Hook, N. J. This mean low water plane was established previously to the completion of the present project in 1880. No subsequent observations on file in this office show the water level to have dropped to within 1 foot of the zero of the gauge, and it is believed that the water will reach this point only at extreme low stage. Ordinary spring freshets reach a height of 7 feet above mean low water. When the creek is in freshet it comes down loaded with silt, gradually forming shoals in certain localities. The mean range of tide is 3.9 feet, approximately. During low stages the mean ebb-current velocity in the lower harbor is about 1 foot per second; the flood-current velocity is too small to have any effect on shipping.

13. *Bed.*—The river bed consists of sand, gravel, and clay, being generally free from rock. From the Hudson River to a point 1¾ miles west of the lighthouse the river bed consists of sand and gravel, with deposits of clay, both free and mixed with sand and gravel. As far as known, rock would not be encountered in this reach above a plane 14 feet below mean low water. Near the South Rondout Ferry there is a narrow shoal in mid-channel composed of rock and large bowlders, over which a maximum depth of 7 feet exists. Before the building of the dry docks at South Rondout, almost directly south of this obstruction, vessels meeting could pass on both sides

[1] Not printed. [2] Plane adopted at time of survey 5.82 or 1.58 feet higher. (See par. 5, p. 23.)

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of this rock, but now have to pass to the north. A shoal extend south from this point about 1,500 feet, composed of soft alluvi material with a maximum depth of 8 feet. From the South Rondou chain ferry west to the head of navigation, the bottom is compose of sand and heavy deposits of silt.

14. *Banks.*—The banks are low on the north side of the creek an are well protected from degradation by an almost continuous line c stone-filled timber bulkheads from the Canoe Club to Eddyville The south shore of the creek is likewise well protected by occasiona wharves, low and gradually sloping but stable banks, and rock cliffs which rise sheer out of the water.

IV. HISTORY OF IMPROVEMENTS.

15. Prior to 1871 improvements were made by private person and corporations, but little, if any, permanent benefit had been derived from them. From a survey made by the Government in 1871, it was found that up to the principal wharves then in existence there was an available channel depth of about 7 feet at mean low water. The report was printed in Senate Document No. 35, Forty-second Congress, second session. A project, based upon this survey, was approved and provided for the formation and maintenance of a channel from the mouth of the creek to deep water in the Hudson River, 100 feet wide and 14 feet deep, to be obtained by means of dredging and diking. This project was approved June 10, 1872, and was completed in 1880 at a cost of $90,000. It is to be noted that the improvement covered only the outlet of the creek, a length of about 3,000 feet. No work has been done by the United States above this point. On completion of the work the north dike was 2,200 feet long with a branch dike running up the Hudson River 1,000 feet. The south dike was 2,800 feet long, with an extension 330 feet long to the lighthouse. The distance between the north and south dikes is about 350 feet. As the result of the work of improvement a channel was obtained from the Canoe Club to the Hudson River with a minimum depth of 13½ feet at mean low water over a width of 50 feet, a minimum depth of 12 feet over a width of 100 feet, and a minimum depth of 10 feet over a width of 200 feet. Since the completion of the project expenditures have been made for maintenance, and have been made chiefly in lengthening and repairing the dikes. (See p. 216, A. R., C. of E., 1912.) Reports or references thereto will be found in the following:

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth of Rondout Creek					[1] 1869	393
Eddyville to mouth of creek	Senate	[1] 35	Forty-second	Second	[1] 1872	510
Mouth of Rondout Creek					[2] 1880	494
Do					[2] 1885	697
Do					[1] 1895	913
Do					[2] 1903	834

[1] No map. [2] Contains map.

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V. EXISTING CONDITION OF CHANNEL.

16. *Depths and widths.*—There now exists in the reach between the north and south dikes from the Hudson River to the Canoe Club (see map) a channel about 75 feet wide at its narrowest point with a minimum depth of 14 feet at mean low water. This channel follows the north dike, the depth across the channel shoaling rapidly to a minimum of 4 feet along the south dike. Directly off the Kingston Gas & Electric Co.'s wharf a shoal has formed with a maximum depth of 13 feet at mean low water over it and a channel width of about 75 feet. The greatest depth lies close to the bulkhead, and as the gas company unloads coal at this point, barges moored to the wharf force navigation into the shallower portion of the channel. In case of boats passing at this point, and especially in the case of a tow and one of the large river steamers, the tug and its tow are frequently forced upon the flats. From the Kingston Gas Co.'s wharf to the steamboat wharf opposite Sleightsboro the channel is about 100 feet wide with a minimum depth of 14 feet. From the steamboat wharf to the chain ferry at South Rondout the channel has a width of about 30 feet at its narrowest point, with a ruling depth of 8 feet. From the South Rondout ferry to Wilbur the channel is about 50 feet wide at its narrowest point with a minimum depth of 14 feet. From Wilbur to the entrance of the Delaware & Hudson Canal Lock at Eddyville, the channel is about 40 feet wide at its narrowest point, with a ruling depth of 8.5 feet, except at a point about 600 feet south of lock, where a bar has formed with a depth of 6 feet over it and a channel width of about 30 feet.

There is one bridge, that of the West Shore Railroad, spanning the creek, with a clear height of 150 feet at mean low water through the center span and a clear navigable width of about 150 feet.

17. *Navigability.*—At present the principal wharfage facilities for large river steamers are situated directly above and below the chain ferry connecting Rondout with Sleightsboro. Rondout is the home port of the well-known steamer *Mary Powell*, and is used by other boats of similar character. At mean low water the river is navigable to this point by craft drawing not more than 13 feet. As passenger and freight boats drawing from 5½ to 14 feet navigate as far up the river as Sleightsboro, it is impossible to handle the large boats except on high water, which consequently causes a considerable delay. Tugs drawing from 6 to 14 feet and towing barges drawing from 5 to 12 feet entering Rondout are also confined to the reach between Sleightsboro and the Hudson River. From Sleightsboro to Wilbur the maximum draft that can navigate is 8 feet, and this only on high tide, and from Wilbur to the tide lock of the Delaware & Hudson Canal Co. at Eddyville the maximum draft that can be carried is 6 feet. At high water the navigable depth is increased by about 4 feet. Rondout Creek forms an excellent winter harbor for Hudson River craft and is so used to about its capacity.

VI. COMMERCIAL SITUATION.

18. *Historical.*—Kingston probably owes its existence in a large measure to the strategic and tactical value of Rondout Creek as an easily defended harbor for the establishment of a trading post with

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the Indians. As the settlement grew, its importance increased as a station and a safe harbor on the important line of communication following the Hudson River, and reached its culmination after the completion of the old New York State canal system and the Delaware & Hudson Canal, the latter terminating at tidewater in Rondout Creek. The last-named canal was constructed to open up the Pennsylvania coal fields to the markets on the Hudson River system, and, quite naturally, during the palmy days of the Erie Canal traffic, Rondout became the cheapest coaling port for the fleet of towing vessels on the Hudson, and it was adopted as the home port for the company which now has obtained almost a complete monopoly of the towing business on the river, and does a considerable business in New York Harbor. The location there of the Delaware & Hudson Canal terminal, and, through its agency, the establishment of the plant of the Cornell Towing Co., have been probably the fundamental elements in determining the growth of Kingston, though, undoubtedly a very important part has been played by a rich deposit of rock from which natural cement was manufactured on a large scale, but which has been exhausted commercially.

19. *Influence of harbor on commercial activity.*—Due to the increased efficiency of railroad equipment and operation, the Delaware & Hudson Canal was abandoned in 1899, and the cement manufacture in Kingston having become also a thing of the past, the commercial situation at present existing is a by-product of the principal original elements responsible for its creation, but still hinges and relies for its future growth in a very large part on the existence of the harbor and creek.

20. *Rail and water connections.*—The city is a tributary port of the Hudson River and its connecting waterways and a station on the main line of the West Shore Division of the New York Central & Hudson River Railroad. The Ulster & Delaware Railroad, controlled by the interests owning the Cornell Towing Co., connects with the Delaware & Hudson Railroad at Oneonta. The New York, Ontario & Western Railroad has a branch line to Kingston, connecting with its main line, and connection is had by ferry to Rhinecliff with the main line of the New York Central & Hudson River Railroad and the Central New England Railroad.

21. *Topographic and climatic conditions.*—The high plateau of Kingston furnishes an admirable site for the development of both residential and manufacturing districts. Along both banks of the creek is a stretch of flat land approximately 2 square miles in area, and admirably suited to commercial development, about one-half of which is now so occupied. Water power in considerable quantity and only partially developed exists within a distance commercially practicable for electrical transmission to the city. Climatic conditions are of the kind common to the Hudson River Valley, having extremes of heat and cold, but being generally healthful. In short, the city is admirably adapted to commercial development, and offers exceptional attractions as a place of residence.

Navigation is closed by ice during an average season from two to three months. The receipt and shipment of products is well distributed throughout the remainder of the year, the busiest season being during the summer and fall.

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VII. EXISTING BUSINESS AND COMMERCE.

22. *Industries.*—The portion of the city on the plateau supports a considerable miscellaneous manufacturing business, including road machinery, piano hardware, miscellaneous machinery and machine-shop products, cigars, lace curtains, shirts, and paper boxes; and is the principal distributing point for the rural district comprising Ulster, Green, and Delaware Counties. The greater part of the water front on the north side of the creek, near the harbor entrance, is occupied by the plant of the Cornell Towing Co. and the terminal shops of the Ulster & Delaware Railroad. Other water-front property will be listed and described briefly in paragraph 25. On the south bank of the creek at South Rondout is the most extensive shipbuilding and dry-dock plant on the Hudson River north of Yonkers. There is also at South Rondout the plant of the American Malting Co.; and the quarrying and rock-crushing plant, with a capacity of 200,000 cubic yards per annum, at Wilbur, is the main plant of the Hudson River Bluestone Co. At Eddyville is a warehouse and shipping point of the Rosendale Cement Co., connected by private railroad with the company's mill. There are also several ice houses on the creek. Lumber yards are located between the upper end of Rondout and Eddyville.

23. *Terminal facilities.*—Referring to inclosure No. 2,[1] the principal wharves and their ownership are listed, and freight-handling facilities are described briefly, as follows:

(*a*) The principal wharf owner is the Cornell Steamboat Co., whose frontage is occupied by offices, warehouses, repair shops, and coal pockets.
(*b*) The Kingston Gas & Electric Co.'s plant is contiguous to the water front, and coal for the operation of its gas plant is unloaded from boats directly into its coal hoppers by means of steam derricks.
(*c*) The Hudson River Bluestone Co. moves and loads its products for shipment by water by means of an electric traveler.
(*d*) All river steamers unload at the steamboat wharves by hand trucks.
(*e*) The Ulster & Delaware Railroad has a trestle on their wharf, from which the coal is dumped directly from the cars into the boats.
(*f*) At the crushed-stone plant barges are loaded by gravity from elevated stone bins.
(*g*) Sand is loaded from trestles into barges by means of dumping tram cars.
(*h*) Ice is also handled by gravity.
(*i*) Cement is loaded by means of steam derricks.
(*j*) In general the greater part of the freight at this port is transferred by modern and efficient methods, which are entirely adequate to handle the present and prospective commerce of the port.
(*k*) The Ulster & Delaware Railroad affords a physical connection with the wharves by tracks running parallel with the wharf frontage on the north side of the creek. Sidings are located at necessary points.
(*l*) The streets along the water front at Rondout are suitably paved, and give easy communication with the water front.

There are no wharves owned by the public, and at present no public space is available for their construction. All wharves are owned by corporations or individuals and are neither open nor adapted for general use, and it appears that discrimination in the matter of charges or in other ways is not uncommon.

24. *Dry docks* at South Rondout can handle boats 180 feet long on keel, 40 to 50 feet wide, and 15 foot draft. In case of necessity, with the blocking removed, 16½-foot draft boats can be docked. The Dry

[1] Not printed.

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Dock Co. is unable to handle boats of a greater draft than 12 feet because of the present condition of the channel.

25. *Vessels.*—The existing water traffic is carried on chiefly as follows:

(*a*) There are three principal steamboats and towing companies doing business out of Rondout—the Central Hudson Steamboat Co., the Cornell Towing Co., and the Knickerbocker Steam Towing Co.

(*b*) The Central Hudson Steamboat Co. runs five steamers to this port, making on the average 750 trips in and out throughout the year. Their tonnage ranges from 570 to 2,011 and their draft from 5½ to 14 feet. In 1912 they carried 19,925 passengers and 28,000 tons of freight.

(*c*) The Cornell Towing Co. runs about 20 tugs to this port, making about 3,000 trips a season. They range in draft from 6 to 14 feet. They handle about 100 canal boats, lighters, and barges, which make about 2,000 trips a season. They draw from 5 to 12 feet of water.

(*d*) The Knickerbocker Steam Towing Co. handles about 15,000 tons of ice a season out of Rondout with a fleet of 10 steam towboats and 50 canal boats, lighters, and barges, drawing from 7 to 11 feet.

(*e*) By sundry barges, lighters, and canal boats.

26. *Commercial statistics for 1912.*—The principal commodities handled by water are lumber, bluestone, ice, coal, building material, sand and gravel, barley, and cement, and the tonnage carried by water, as obtained from the best available information, is as follows:

For year 1912.

Commodity.	Short tons.	Commodity	Short tons.
Coal	231,150	Crushed stone	175,000
Lumber	18,300	General merchandise	19,925
Bluestone	15,000	Barley	7,500
Building material	2,000	Cement	33,000
Ice	59,200		
Sand and gravel	21,700	Total	583,775

This commerce has an approximate value of $3,000,000.

27. *Coal movement.*—It will be noted that a large amount of coal is still shipped from Rondout. This coal, together with that burned by the tugs and steamers coaling at Rondout, is brought from Pennsylvania by the Delaware & Hudson Co.'s railroad to Oneonta, whence it is brought to Rondout by the Ulster & Delaware Railroad. Thus, though the Delaware & Hudson Canal has been abandoned with the consequent loss to Kingston of an all-water connection with the rich Pennsylvania coal fields, it is succeeded as a coal carrier by a practical and economical rail route, which to-day is doing more business than was done by the old canal with its limited facilities.

28. *Delaware & Hudson Canal.*—A short portion of the Delaware & Hudson Canal is still used from Rosendale to Rondout by the Rosendale Cement Co., and by the Hudson River Freight Line, for carrying coal.

29. *Passenger traffic.*—Its location at the terminus of the Ulster & Delaware Railroad, which penetrates the Catskill Mountains, makes Kingston the gateway to that famous region, the summer resort of a great number of people from all parts of the country, but especially from New York City. Daily, during the summer, several thousands of visitors, arriving and departing via the West Shore and the New York Central Railroads, and by the boats of the Central-Hudson

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Steamboat Co. and of the Hudson River Day Line, are transferred at Kingston. These people support an extensive business in provisions and supplies, which is handled largely through this port.

VIII. THE NEED FOR IMPROVEMENT.

30. *Economic basis.*—Two salient objects are to be considered in determining the advisability of improving Rondout Creek: First the need for improvement in the interest of existing business; second, the effect of improvement on the development of new business, and, through it of the community. Having arrived at a satisfactory conclusion regarding these two points, it will then become necessary to study the scope and character of the improvement which would prove most advantageous as an investment of public funds. This development of the question belongs rightly in a report on the survey in connection with the formulation of a project, and will be touched on here only to the extent of reaching a tentative estimate of cost.

31. *For present business.*—It has been shown that Rondout Harbor supports a considerable commerce and is the home port of the fleet of towing vessels which move the bulk of the freight traffic of the Hudson River. The plant built in connection with the construction and maintenance of this fleet represents a heavy investment, and hence could be moved only at great cost. A shipyard is a logical accessory to such a port, and such a shipyard exists there. In addition, two large quarrying industries, one important malting works, a cement factory, and a considerable ice business depend on the harbor and creek for existence. The depth of water is not sufficient for the needs of the towing vessels, and the dry dock can be reached only by small boats, so that the usefulness of the plant is limited to that extent. The stone industries, the cement works, and the ice houses, through the shoaling of the channel and the present tendency toward a general increase of draft of river craft, are no longer able to compete with industries located on the main river, but, in other respects less advantageously. All shipyards on the river have been unusually active this year, and this activity will probably increase on the opening of the State Barge Canals. The increased cost of cement has begun to revive the demand for bluestone flatting, and crushed rock is a commodity the demand for which increases as the more accessible quarries are exhausted. In short, improvement of the channel seems necessary in the interest of existing business.

32. *For future business.*—It has been shown that Kingston possesses important advantages for the development of manufacturing business. Referring to House Document No. 1160, Sixty-second Congress, third session, a tendency seems manifest on account of the lower suburban real estate values and taxes in this section of the country, for business to seek locations in the environs of New York City rather than in the city itself, provided transportation facilities are ample. The increase in commerce on the Hudson River expected to result from the opening of the New York State Barge Canals should affect all river ports. This port, being the headquarters of the existing towing business, should feel the effect particularly. With such advantages, improvement in the interest of future growth seems likely to be effective.

33. *Nature and scope.*—A tributary port, like a feeder to a railroad, should accommodate the standard carriers of the main system.

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Rondout is on two inland systems: (1) A deep water system, including the Hudson River from Hudson to New York (navigable to Rondout for vessels of deepest draft), New York Harbor, and Long Island Sound and Bays; and (2) the shoal water system of the New York State Barge Canals. The tugs of the Cornell Towing Co. are designed for both systems, the heavier work being done by vessels of the New York Harbor and Long Island Sound type, drawing from 12 to 15 feet at rest, and the lighter work on the upper Hudson and at the brickyards and small ice houses by smaller vessels drawing from 6 to 10 feet at rest. The river steamers and most of the barges entering Rondout are hybrid—too big to navigate the State canals, though able to go to Albany on favorable tide. In the future, it is believed that the barge canal carrier, the harbor and sound tug, and large steamers on barge canal draft (10½ feet) will become the standard vessels as to draft for the harbor and the creek at Rondout, which it is, therefore, believed should be adapted to both systems. Accordingly, it is considered as a preliminary assumption that the lower harbor up to the dry dock should be given a channel 18 feet deep at mean low water and 300 feet wide, and the balance of the creek up to the cement dock a channel 14 feet deep and 200 feet wide.

34. *Estimate of cost.*—Owing to the meager data now available for the upper portion of the locality, an accurate estimate for improvement can not be made without a survey.

IX. CONCLUSIONS AND RECOMMENDATIONS.

35. *Conclusions.*—In my opinion, Rondout Harbor and Creek are worthy of a survey with a view to determining the nature and scope of such further improvement as may appear desirable.

36. *Recommendation.*—It is accordingly recommended that authority be given to make the necessary survey, and to prepare and submit a project for improvement.

W. M. BLACK,
Colonel, Corps of Engineers.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
August 12, 1913.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. For reasons stated herein, the board concurs with the district officer, who is also division engineer, in recommending a survey in order to determine the extent and advisability of the improvement.

For the board:

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

LETTER OF CORNELL STEAMBOAT CO.

CORNELL STEAMBOAT CO., *New York, May 26, 1913.*

DEAR SIR: I beg to present the following with reference to Rondout Creek.

Inclosed is a statement of the firms doing business on Rondout Creek with an estimate of the tonnage handled by each.

The size of the cargoes handled is limited by the draft of water, and an increase to a depth of 14 feet would permit the handling of this material in much larger cargoes and at a greatly reduced expense.

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The presence of shoal spots makes it possible to handle the present cargoes on high water only, and except when high water comes in the late afternoon or evening there is a delay of a day in the movements of most of the loaded boats.

In the case of the dry docks, this company is unable to dock the large steamers because of insufficient water to get to the dry dock. Rondout has the only large dry-dock facilities on the Hudson River, and these dry docks are shut out by the present depth of water from a much larger business.

In general, the shipping from the stone quarries, sand, and coal docks are limited, because these places are not on a competing basis with other points on the Hudson River. The deepening of the channel would place these industries in the same position for an increase of business as if they were on the main channel of the river.

Yours, truly,

CORNELL STEAMBOAT CO.,
FRED'K COYKENDALL, *President.*

Capt. R. D. BLACK,
Corps of Engineers.

STATEMENT.

Approximate tonnage Rondout Creek, 1912.

	Cargoes.	Commodity.	Tonnage.
Kingston Gas & Electric Co	6	Coal	4,800
W. J. Turck Co	6	Lumber	1,500
Hudson River Bluestone Co	100	Bluestone	15,000
David Gill	10	Building material	2,000
Cornell Steamboat Co. (pockets), including Hudson River Freight Line.			
Rhinebeck & Kingston Ferry Co			
William Hiltebrandt	2	Coal	550
Central-Hudson Steamboat Co		General merchandise.	
Erie Railroad property, tenants as below:			
Ulster & Delaware R. R. Co	15	Ties and lumber	5,700
Hudson River Freight Line	1,492	Coal	225,000
Jac. Rice & Co	20	Lumber	5,000
R. Lenahan & Co	13	do	3,000
John A. Fisher	20	Ice	10,000
R. T. Van Deusen	38	Sand	8,500
J. Quigley	6	Ice	1,200
Consolidated Rosendale Cement Co	106	Cement	35,000
Foster-Scott Ice Co	20	Ice	10,000
Hudson River Freight Line (out of canal)	78	Sand	8,200
Baisden & Tremper	8	Lumber	1,600
Hiltebrandt, D. D., Co	19	do	4,500
American Malting Co	30	Barley	7,500
Do	4	Coal	600
Clark & Main	30	Sand	7,000
Do	2	Ice	1,000
Knickerbocker Ice Co	50	do	25,000
North River Stone Co	350	Crushed stone	175,000
D. H. Zoller	30	Ice	6,000
Diamond & McNamee	20	do	6,000
Light boats to dry dock for repairs	500		

LETTER OF THE MARY POWELL STEAMBOAT CO.

MARY POWELL STEAMBOAT CO., *New York, December 24, 1913.*

DEAR SIR: At a meeting held on Friday, December 19, at Kingston, N. Y., in relation to the improvement of the Rondout Harbor and Creek, Mr. J. E. Byron, engineer, from your office, requested me to give my opinion, in writing, as to the condition of the depth of water at our dock, foot of Canal Street.

The Central-Hudson Steamboat Co.'s dock adjoins our dock, and we find the water at times very shallow, owing to the steamer *B. Odell* working her engine while laying at the dock for an hour or more before leaving for New York. The *Odell* is a propeller type of boat and draws about 14 feet. By working her wheel she digs a hole and throws the mud and sand up in our berth, which gives our boats (steamers *Albany* and *Mary Powell*) great trouble to get away from the dock when the tide is low, on account of the bar thrown up by the *Odell*. I mention this only to show the shallow water at Rondout and the necessity for doing dredging work.

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The water at Turcks Lumber Yard dock is also very shoal. The steamers *Homer Ramsdell*, *Odell*, and other boats have grounded there and have laid aground for several hours at a time. It would be impossible for our steamer *Albany* to pass this point when one of the larger boats lay aground, as they lay in the best depth of water.

Yours, respectfully,

A. E. ANDERSON, *General Manager.*

Capt. R. D. BLACK,
Corps of Engineers.

LETTER OF R. LENAHAN CO.

R. LENAHAN CO.,
Kingston, N. Y., December 24, 1913.

DEAR SIR: In regard to the deepening or dredging of the Rondout Creek, would say that we are now obliged to lighter our lumber from New York at a cost of $2 per thousand feet, whereas if there was sufficient water, we could have vessels come to our yard direct from the south, at a cost of not more than $1 per thousand feet. We consume or use in our business from 2,500,000 to 3,000,000 feet of timber per annum, and would consider the deepening of the creek a great benefit to all commerce and trade in this vicinity.

We are, very truly, yours,

R. LENAHAN CO.
Per J. F. DWYER.

Capt. R. D. BLACK,
Corps of Engineers.

LETTER OF MR. CALVIN TOMKINS.

NEW YORK, *December 24, '13.*

DEAR SIR: I understand conference was held at Rondout on the 19th instant relative to deepening Rondout Creek to permit vessels drawing 12 feet draft.

I sincerely hope this draft can soon be attained.

Rondout Creek is perhaps the best harbor on the Hudson River between Albany and New York. Formerly a large business was transacted there, and when our cement works were running we were continually loading vessels drawing over 12 feet of water.

We are contemplating the erection of a rubber factory at this point, which would necessitate direct access by small coastwise steamers, and the prospective depth of water in the creek will be one of the determining factors of erection.

I think Rondout Creek should be made adaptable for both light draft coastwise and canal commerce.

Yours truly,

CALVIN TOMKINS.

Capt. R. D. BLACK,
Corps of Engineers.

LETTER OF C. HILTEBRANT DRY DOCK CO.

C. HILTEBRANT DRY DOCK CO.,
South Rondout, N. Y., December 30, 1913.

DEAR SIR: With reference to deepening Rondout Creek we desire to call your attention to the advantages the deepening of said creek would be to our company.

We use about 2,000,000 feet of lumber a year, the same being delivered to us by lighter. If the channel was deep enough we could have the lumber delivered by schooner direct to our plant, thus saving us about $2 per thousand feet.

We have two floating dry docks. No. 1 dock has a lifting capacity of about 1,100 tons and capable of taking out a vessel 200 feet long drawing 17 feet of water. Dock No. 2 has 800 tons capacity and capable of docking a vessel 150 feet long drawing 14 feet water.

We are oftentimes compelled to refuse work on account of not having enough water in the channel to bring vessel to our docks.

Very recently we were compelled to turn down a barge that drew 15 feet of water that had to be entirely rebuilt, which was a considerable loss to us. Quite frequently barges or "boxes" 13 or 14 feet deep sink in the river, and we are offered the work of

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docking same, but must refuse on account of lack of water. We can not dock some of the tugs owned by the Cornell Steamboat Co. for the same reason. Such is also the case with some of the Central-Hudson Steamboat Co.'s boats.

We no doubt would add 20 per cent to our business if we had channel that would admit a vessel drawing 17 feet of water at high tide.

We have the only dry dock this side of New York sufficiently large enough to dock vessels as mentioned above.

We earnestly hope that something will be done in the very near future to give us a deeper channel.

Yours truly,

C. HILTEBRANT DRY DOCK CO.
F. J. WALTER, *Secretary.*

Capt. R. D. BLACK,
Corps of Engineers.

LETTER OF CENTRAL-HUDSON STEAMBOAT CO.

CENTRAL-HUDSON STEAMBOAT CO.,
Newburgh, N. Y., December 31, 1913.

DEAR SIR: At the hearing before the representative of the War Department at Rondout, Friday, December 19, 1913, in relation to deepening and widening the channel at Rondout Creek, all parties present were advised to present their argument in writing. It was my privilege to represent the Central-Hudson Steamboat Co., and the facts we submit for consideration are as follows:

First. Occasional grounding and frequent dragging by steamer *Benjamin B. Odell*, steamer *Homer Ramsdell*, steamer *Newburgh*, and steamer *Marlborough* in the channel between the westerly end of the north dike and the westerly end of the Delaware & Hudson Co. flat inclosure on south side of Creek. Draft of steamers: Steamer *Odell*, 12 feet aft, 8 feet forward; steamer *Ramsdell*, 11 feet aft (keel extension forming rudder shoe dropping 20 inches below base of keel), and 6 feet forward; steamer *Newburgh*, 10 feet aft, 5 feet forward; steamer *Marlborough*, 13 feet aft, 5 feet forward. The rudders of all excepting the steamer *Ramsdell* carried and supported by single pintle at base or heel.

Second. Our property on Rondout Creek is divided in two sections by a ferry slip. During the week it is necessary to shift a steamer from the westerly to the easterly section to permit a later boat to dock, coal, and remain in vacated berth. The shifting vessel frequently is aground before passing the ferry slip, and detains travel until a tug can be got to assist. This is caused primarily by local conditions, as a city sewer empties west of ferry slip and the silt is carried downstream necessarily affecting the entire channel eastward.

Third. All steamers of our line entering this creek, turn or wind at all hours 180° in the small pocket west of the westerly end of the "Island dock." This movement is performed by steaming ahead with wheel hard to starboard to obtain a swing, then backing and filling until to about an angle of 45°, when a line is gotten ashore and the turn is completed. Any shoals along the north shore affect steerageway in the forging moments.

Fourth. These deep-draft boats entering the creek, crowd the north shore from the entrance to wharf, and owing to the narrow channel making it hazardous in meeting tows and vessels of similar type, we are finally of the opinion that the channel should not be less than 200 feet wide. The foregoing type of steamers are liable at any time to need the services of a dry dock to reset keys in a loose wheel, remove a line entangled in same, unship and repair damaged rudder, or remove a defective or damaged sea cock. The foregoing are realities which we have experienced and we can cite an instance of a few years ago, when the steamer *Poughkeepsie* unshipped rudder and beat the stock on a shoal at mouth of creek and had to be towed to New York for dockage, on account of not being able to get to the dry dock less than 1 mile westward from our wharf, owing to narrow channel and shoal water.

Fifth. Concerning depth, we are of the opinion that not less than 15 feet mean low water would answer our requirements with the present type of steamers.

Respectfully submitted.

CENTRAL-HUDSON STEAMBOAT CO.,
By WM. E. BELL.

Capt. R. D. BLACK,
Corps of Engineers.

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LETTER OF NORTH RIVER STONE CO.

NORTH RIVER STONE CO.,
Kingston, N. Y., January 2, 1914.

DEAR SIR: Confirming a verbal report made to your representative at a meeting held at Mr. Coykendall's office at Rondout, N. Y., on December 19 in regard to the deepening of the channel of Rondout Creek, will say that we have been handling about 500 barges per year, but have enlarged our plant to about double its former capacity, and as we have never had any difficulty in disposing of our products it is almost certain that beginning with the coming spring season we will handle nearly double the number of barges as formerly. As the condition of the bar in the creek is at present it is a very great handicap to us in getting the barges to and from the river, and often causes us to hold them until high water, especially if they draw 10 feet or over, and if they miss the tows it is also an additional expense, as they cost us for daily rent from $4.50 to $6 per day, besides it often disappoints our customers and causes them often to go elsewhere for future orders where they are certain of prompt delivery. The larger the barge the cheaper we can handle our product, and by having a 12-foot channel we could ship at any time and also secure many orders that we are now compelled to turn down owing to the shallowness of the water. Hoping that we may be successful in having our request granted and that you will readily see the necessity of having this work done at an early day, we are,

Respectfully yours,

NORTH RIVER STONE CO.

Capt. R. D. BLACK,
Corps of Engineers.

LETTER OF CORNELL STEAMBOAT CO.

CORNELL STEAMBOAT CO.,
New York, February 3, 1914.

DEAR SIR: On behalf of this company I desire to present the following information regarding the proposed improvements at Rondout Creek.

This company controls and operates 73 towing steamers on the Hudson River, varying in draft from 6 to 14 feet. All of these steamers are repaired at Rondout. With the present channel it is impossible for us to dock the larger steamers at Rondout and we are obliged to send boats for docking to New York, where the cost of labor is considerably higher and where there is much added expense because of lost time. This matter is very serious in cases of emergency when boats must be sent away from our repair shops to New York for a small amount of repairs.

The business of this company consists of towing cargo barges to destination. In connection with the barges delivered to Rondout Creek, it is now necessary to lighter the cargoes from deep draft boats at a considerably added expense. The estimated extra cost of lightering lumber is 45 cents per thousand.

Rondout is a terminal point of one division of Hudson River tows and with the present channel conditions in the creek the time of starting depends upon the time of high water, because most of the cargo barges must be brought out at high tide in order to carry their maximum load under these conditions. With tides coming in the evening the starting of tows is delayed to such an extent as to involve a loss of time amounting, for all the boats in the tow, to one day at destination. It is estimated that 30 per cent of the barges leaving Rondout are subject to delay at destination of from 8 to 12 hours beyond what would be necessary if full loaded barges could be taken out as soon as they are loaded.

It is estimated that the cost of handling freight from the Hudson River Bluestone Co.'s piers could be lessened 40 per cent if barges carrying 600 tons could be loaded, instead of the present type of boat of 250 tons.

It is estimated that the volume of business from the North River Stone Co.'s plant could be doubled with a channel sufficient to provide for full loaded boats at all times, and that a saving of from 3 to 5 cents per ton in freight could be effected under these conditions.

We are informed that there are two sand properties in the vicinity of the Wilbur Bridge which can be largely developed if proper channel facilities are afforded for taking out the material.

It is expected that the completion of the New York State Barge Canal will produce a type of boat drawing between 11 and 12 feet of water for general use on the Hudson River and the smaller type of canal boat will drop out of existence. The present

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channel of Rondout Creek is insufficient to permit the use of such a type of craft and cargoes from the canal to Rondout Creek could not be handled direct to unloading piers in this type of boat.

We understand that statistics of the business done from Rondout Creek have been sent to you by the parties interested.

Very truly, yours,

CORNELL STEAMBOAT CO.,
FREDERICK COYKENDALL, *President.*

Mr. J. E. BYRON,
Junior Engineer,
Albany, N. Y.

LETTER OF KNICKERBOCKER ICE CO.

KNICKERBOCKER ICE CO,
New York, February 5, 1914.

DEAR SIR: We submit herewith reasons why this company would be benefited by the proposed improvements to Rondout Creek.

We have a 17,000-ton ice house well up in the creek, and the lack of water makes it possible to only bring out part-loaded and small cargoes on the tide, causing considerable delay and excessive expense.

With channel 12 to 14 feet, our regular-sized barges could be fully loaded and taken out to Hudson River regardless of what time they were loaded.

As it is now, even small cargoes, if finished at a time except high water, it is necessary to wait a full tide to take them out.

Our experience shows that we are able to load our boats to draft of about only 9 feet, it taking about 30 loads to empty the house. With water enough for our regular barges to load full, we would take the same house out in about 16 boats, a saving of the expense of towing and charter on 14 loads, not to mention the saving of time to the company during the warm weather.

We have also been put to considerable expense by our boats being damaged by reason of their being grounded while being towed out of the creek. In more than one instance they have grounded on the first of a falling tide and remained so until the next high water, causing much damage to the boat.

We earnestly urge that the proposed improvements be recommended, inasmuch as this company will greatly benefit thereby.

Respectfully, yours,

W. D. WYNNE,
Superintendent of Transportation.

Capt. R. D. BLACK,
Corps of Engineers.

LETTER OF CORNELL STEAMBOAT CO.

CORNELL STEAMBOAT CO.,
New York, February 5, 1914.

DEAR SIR: We have had a tabulation made of the property on Rondout Creek from the Hudson River to Eddyville and find that there are 42 separate docks, the original cost of building which represents an investment of about $750,000. These docks are all in condition for use if channel facilities were provided for the business which could be handled over them. At the present time about 25 per cent of the dock front is not in use—in the case of the sand properties solely for the reason of insufficient channel.

As a supplement to the letter from the North River Coal Co., dated January 14, I am told that the saving in cost of freighting the tonnage handled by that company in vessels drawing from 12 to 14 feet, as compared with the present type of boat necessarily used, would be not less than 5 cents per ton.

The foregoing, I understand, completes all of the information which I was to secure at the request of Mr. Byron, unless some of the individuals referred to in his letter have failed to respond according to the arrangement.

Very truly, yours,

FREDERICK COYKENDALL, *President.*

Capt. R. D. BLACK,
Corps of Engineers.

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LETTER OF THE WILLIAM J. TURCK CO.

THE WILLIAM J. TURCK CO.,
Kingston, N. Y., February 5, 1914.

DEAR SIR: We are vitally interested in the deepening of the waters of the Rondout Creek, as we handle approximately about 4,000,000 feet of lumber annually, which costs us an additional expense of lightering because of shallowness of the water of about $1.25 M. Were the channel deepened, it would mean that deep-draft vessels could deliver direct from southern ports to our wharf. Trusting that the project may not be abandoned, we are

Very truly, yours,

THE WILLIAM J. TURCK CO.

Capt. R. D. BLACK,
Corps of Engineers.

LETTER OF THE CLYDE STEAMSHIP CO. AND THE MALLORY STEAMSHIP CO.

NEW YORK, *January 30, 1914.*

DEAR SIR: Referring to your letter of January 22, in regard to suggested improvements at Rondout Creek, N. Y., especially with reference to your inquiry as to whether the smaller coasting vessels of these companies would be able to make deliveries of lumber at that point.

I presume you wish to know whether we would consider having our steamers actually call at points on Rondout Creek, provided there was sufficient water. In reply would state that "so far as our business is concerned, it is moved principally by steamers operating on regular lines, and it would be impracticable for them to call at Rondout, unless with a full cargo. Of course so far as steam vessels going to that point is concerned, the practicability would depend entirely on the depth of water and facilities furnished.

"The smaller steamers in the coastwise trade draw anywhere from 15 to 19 feet, length being from 200 to 300 feet, and beam 30 to 40 feet."

Yours, truly,

C. D. MALLORY.
A. G. M.

Capt. R. D. BLACK,
Corps of Engineers.

LETTER OF C. HILTEBRANT DRY DOCK CO.

C. HILTEBRANT DRY DOCK CO.,
South Rondout, N. Y., February 3, 1914.

DEAR SIR: In reply to your letter of the 31st ultimo, would say that we do not believe southern lumber can be delivered as cheaply at Rondout Creek by the smaller coasting steamers as by schooners, nor do we believe that steamer delivery would be as preferable as schooner.

In our judgment the shipbuilding in the Rondout Creek would not be likely to take in one shipment sufficient lumber to make a cargo for a steamer of the dimensions you quote.

Schooner deliveries are much cheaper than steamer.

Yours, truly,

C. HILTEBRANT DRY DOCK CO.
F. J. WALTER, *Secretary.*

Capt. R. D. BLACK,
Corps of Engineers.

LETTER OF NORTH RIVER COAL CO.

NORTH RIVER COAL CO.,
Kingston, N. Y., January 14, 1914.

DEAR SIR: In the matter of dredging the Rondout Creek, would say that our annual coal tonnage in cargo lots out of the creek is considerably more than 200,000 tons.

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It is important to us as shippers that we load vessels drawing under load, at least 14 feet. Our business depends in a measure on our ability to load vessels of heavy draft. Heretofore, we were unable to secure a large tonnage because the business called for loading vessels of 14 feet draft, which condition we could not meet. We have had cases where vessels grounded under load, and in consequence the owners will not send their vessels back for reloading.

To improve the present conditions and place this company on the same footing, so far as draft of water is concerned, with the Newburgh and Cornwall trestles, we request your favorable consideration and action to the end that we may load to 14 feet.

Yours, truly,

NORTH RIVER COAL CO.
R. S. RODIE, *President.*

Capt. R. D. BLACK,
Corps of Engineers.

LETTER OF THE NEW YORK CENTRAL & HUDSON RIVER RAILROAD CO.

NEW YORK CENTRAL & HUDSON RIVER RAILROAD CO.,
New York, January 24, 1914.

DEAR SIR: With further reference to your letter of December 27, in regard to freight statistics at Kingston station.

In reply I would say that the total tonnage in and out of Kingston was as follows:

Year.	Inbound.	Outbound.
	Tons.	*Tons.*
1912	322,141	167,186
1913	321,743	160,783

We have not attempted to classify this tonnage as to commodities, as we do not keep our records in that manner.

With reference to the value of the freight would say that we have no information on this point.

I trust the above will be of service to you.

Yours, truly,

IRA H. HUBBEL,
General Freight Agent.

Capt. R. D. BLACK,
Corps of Engineers.

LETTER OF CORNELL STEAMBOAT CO.

CORNELL STEAMBOAT CO.,
New York, February 4, 1914.

DEAR SIR: Supplementing our letter of February 3, we wish to add that it is estimated that the use of barges of the type fitted for operation on the Erie Canal will result in a saving on freight rates generally of more than 25 per cent and that this saving would apply practically to all of the tonnage to Rondout Creek, which is now handled in the small boats.

We are having an estimate made of the value of the dock front construction and expect to forward that to you to-morrow.

Very truly, yours,

CORNELL STEAMBOAT CO.,
FREDERICK COYKENDALL, *President.*

Capt. R. D. BLACK,
Corps of Engineers.

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SURVEY OF RONDOUT HARBOR, N. Y.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE, FIRST DISTRICT,
New York City, October 19, 1914.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Report on survey of Rondout Harbor, N. Y., ordered by river and harbor act of March 4, 1913.

1. In compliance with instructions contained in department letter of August 18, 1913, the following report is submitted on the survey of Rondout Harbor, N. Y., from the Hudson River to the head of navigation, authorized by the river and harbor act approved March 4, 1913.

2. A geographical description of the locality, the physical characteristics of the waterway, a history of past improvements, a discussion of the present commercial situation, with details regarding terminal facilities, steamship lines, etc., and a statement of commercial statistics for the year 1912 are contained in the report of the preliminary examination submitted July 21, 1913. Since the submission of that report a survey of the harbor and creek has been made and additional information relative to existing and prospective commerce has been collected.

I. THE SURVEY AND ITS RESULTS.

3. *Operations.*—The field work of the survey was commenced September 16, 1913, and was completed October 22, 1913. Plotting of results was completed in January, 1914. During the preparation of the maps, efforts were made to supplement commercial data on hand, and an informal hearing was given parties interested in the navigation of the creek in order to determine the concensus of opinion as to the requisite improvement.

4. *Maps, etc.*—The more general results of the survey are shown on the four charts herewith. All soundings and shore elevations are referred to a plane of mean low water 0.86 foot below the plane of M. S. L. at Sandy Hook, N. J. This mean low water plane differs from the planes heretofore used which, as will be shown, were found to be erroneous and misleading. The new plane is based on observations taken during two lunar periods in the months of October and November, 1913. Soundings in the channel were taken at intervals of about 15 feet on ranges 150 feet apart and normal to the shore line. Characteristic soundings only are shown on the charts herewith. The origin of coordinates is an imaginary point on the east bank of the river south of Rhinebeck. References in this report are to distances due west of this point measured on an east and west line. The topography to the 15-foot contour was taken by the field party during the survey, and beyond this contour the topography is adapted from charts of the United States Geological Survey. The small ledges of rock near South Rondout and at Reference 8 + 000 (sheet 2) were developed by borings, and other borings were taken at intervals of about 25 feet along the center line of the existing channel in order to develop any other reefs which might exist. Borings were also taken where the configuration or character of the shore seemed to indicate

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that submerged rock might be found in the vicinity, and in this process the 18-foot rock contour was developed wherever rock was encountered either above or at that depth. All borings were taken with hand boring rods having an iron shoe about six feet long.

5. *Datum.*—It is believed that what has been said in the report on preliminary examination relative to the physical characteristics of the stream need not be elaborated to any extent in this report; though it should be noted, as referred to above, that the plane of mean low water now adopted is 1.58 feet higher than that used in the preliminary examination, and is based on the two months' observations taken during the survey. The present assumed plane of mean low water is 5.82 feet below the U. S. E. D. B. M. on Rondout Lighthouse and 0.86 foot below the plane of M. S. L. at Sandy Hook, N. J., while the old plane was assumed at 2.44 feet below this plane. The lowest low water observed was 2.21 feet below the plane of M. S. L. The mean range of tides as determined by observations taken during the survey was found to be 3.57 feet instead of 3.9 feet, as previously reported.

6. *Existing condition of channel.*—There now exists in the reach between the north and south dikes, from the Hudson River to the Kingston Gas & Electric Co. (Ref. 4 + 230, sheet 1), a channel with a least width of 50 feet and a depth of 15 feet at mean low water; thence to deep water off the Cornell Steamboat Co.'s wharves (Ref. 6 + 200, sheet 1), there is a channel with a least width of 50 feet and a depth of practically 14 feet. Between Sleightsburg and South Rondout (sheet 2), the limiting channel dimensions at mean low water are 9 feet depth and 50 feet width. From South Rondout to Reference 14 + 000 (sheet 3), a channel depth of practically 15 feet obtains with a width of from 50 to 100 feet. Thence to the wharves of the Consolidated Rosendale Cement Co. (Ref. 17 + 000, sheet 4), there is a navigable channel depth of 12 feet for a width of 100 feet. Thence to the old Delaware & Hudson Canal outlet lock at Eddyville (Ref. 17 + 400), the ruling depth is about 8 feet for a width of 100 feet.

7. *Slack water navigation.*—Navigation in the tidal portion of the creek ends at the Eddyville Dam (Ref. 18 + 000), which maintains the water level in the upper section of the creek. Slack water navigation is provided in the creek to High Falls, 8 miles above Eddyville, by a series of dams and locks, each with an average rise of about 10 feet, these works forming a part of the old Delaware & Hudson Canal. The maximum draft that can be carried through the canalized portion of the creek is about 5 feet. Between High Falls and the Delaware River this canal has been abandoned since 1899.

8. *Bridges.*—There are at present two bridges spanning the tidal portion of the creek. The West Shore Railroad Bridge (Ref. 12 + 000, sheet 3), has a clear height of 150 feet 2 inches at mean low water and a clear navigable width of about 250 feet. The highway bridge at Eddyville (Ref. 17 + 500, sheet 4), has a clear height at mean low water of 38 feet 6 inches under the center fixed span and a clear navigable width of 150 feet. A request for a permit to construct another highway bridge across the creek has been submitted by the New York State Highway Commission. It now seems probable that the bridge when built will be a high level fixed type with a clearance of not less than 85 feet above M. L. W. level and will be situated in the

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vicinity of Wurtz Street, spanning part or all of the channel in a manner that will cause practically no obstruction to navigation.

9. *Meteorological data.*—The annual range of temperature is about from − 20° to + 100° F. with occasionally greater extremes. The harbor is usually closed by ice during the latter half of December and remains closed to navigation until the middle of the following March. In general, the period of closure averages about one month less than that which prevails on the upper Hudson River. At Albany, N. Y., distant about 55 miles (the nearest point for which records are available), the mean annual precipitation is 35.3 inches. The prevailing winds are south and northwest, and during the past five years velocities of 15 to 25 miles per hour have prevailed on an average for 6 days and 2 days per annum, respectively, from the above directions.

II. COMMERCIAL SITUATION.

[See Part VI, preliminary examination report.]

10. The commercial situation at Rondout Creek is largely the result of its geographical location and of the geological formation of the locality and includes several interests, the importance of which is not reflected directly in the statistics of tonnage handled.

11. Geographically, Rondout Creek is considered as half-way port between New York City and Albany, being 90 miles north of the former and 55 miles south of the latter, and is the most commodious protected harbor along the Hudson River. These circumstances have made it the home port and winter quarters of the Cornell Towing Co., which has a practical monopoly of the towing business on the Hudson River. With headquarters at Rondout, the towboats work north and south to the limit of their coal supplies, and tows bound in different directions change tugs in this neighborhood. These tugs find it a convenient port for coaling up for the return trip. The fleet of this company numbers 73 tugs, drawing from 6 to 14 feet of water, and represents an investment of about $4,000,000.

12. *Shipyards.*—The same circumstances make Rondout an economically advantageous location for shipyards where boats engaged in river traffic can be repaired without being towed to New York, and this is especially important in the case of boats which are injured or spring leaks in the long tow of nearly 150 miles between Albany and New York. There are six shipyards now in operation, one of them operating two dry docks with capacity for boats of 1,100 tons and 800 tons burden, respectively. (See inclosure 4, par. 5, about limitations to usefulness.)

13. *Coal shipments.*—Extending southwesterly from Kingston to the Delaware River is a valley separating the Catskill Mountains from the Shawangunk Range. This valley with the streams traversing it provided facilities for the construction and operation of the Delaware and Hudson Canal, which carried a large quantity of Pennsylvania coal to the Hudson River for distribution. Before the development of the railroads this traffic averaged over 1,000,000 tons yearly. This canal is now abandoned for the greater part of its length, and most of this coal is now carried by rail direct to its destination; but the local demands of the industries along the creek and of the Hudson River ports within range of economic distribution from Rondout with the present transportation facilities still cause the annual con-

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sumption or distribution at this port of upwards of one-quarter million tons of coal annually.

14. *Natural products.*—Geologically, Rondout Creek is banked by practically inexhaustible deposits of building materials—limestone, bluestone, sand and cement rock. The limestone is crushed for use in concrete, and the plant of the North River Stone Co. has been designed for a capacity of 2,500 tons per day. Bluestone is in general use for flagging. Cement rock is used in the manufacture of Rosendale cement, and shipments last year are reported as about 170,000 barrels, though through the increasing efficiency in the manufacture of Portland cement this business has declined.

15. *Destination.*—Most of the water-borne commerce of the creek is consigned to ports on the Hudson River, New York Harbor, or Long Island Sound, the bulk of the remainder being coal shipped through the New York State Canals. Except in the canals, there is a greater depth in these waterways than exists through the creek, and the size of vessels which can call at Rondout is limited by the Rondout channel depths. The greater part of the commerce is between New York and Rondout through a reach of the Hudson River where there is ample depth for all classes of inland waterway craft, and, therefore, this business is forced to compete on unequal terms with products of other localities on the Hudson River and its connecting waterways, where channel conditions are better.

16. *Manufacturing.*—The city of Kingston proper is one of the smaller manufacturing centers of New York State, and according to the State industrial census of 1912, had 4,204 wage earners employed in factories and shops, and a value of manufactured products, according to the Federal census of 1910, of $5,985,738. Excepting the industries immediately related to navigation, the shops and factories are located in the high-level section of the city, and distant over 1 mile from the water front. Thus the manufactured products are shipped almost entirely by rail, on account of the large cost of transfer between factory and wharf due to the distance and difference in elevation. The manufactures comprise tobacco products, clothing, hardware, etc., which, though valuable, are not of great weight, and would have but small effect on the tonnage of the port.

17. In the chapters on "Commercial situation" and "Existing business" (Pts. VI and VII) in the report on preliminary examination are data relative to connecting waterways and railroads, terminal facilities, descriptions of vessels, passenger traffic, and the position of Rondout as the shipping point of a tributary farming and summer resort district.

18. *Statistics.*—As reported in detail in the report on the preliminary examination (paragraph 26) the tonnage carried in the creek in 1912, amounted to 583,775 short tons, of a reported value of $3,000,000, which is believed to be a rather low estimate. This tonnage was largely composed of bulk freight especially adapted to water shipment in large lots, e. g.:

	Short tons.
Coal	231,150
Lumber	18,300
Ice	59,200
Crushed stone	175,000
Cement	33,000
Total	516,650

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19. *History of commercial activity.*—Excepting the coal and lumber, all of the commerce just listed is in products indigenous to the creek. The coal seeks this port through its position as a terminus of the Ulster & Delaware Railroad, which, though its connections with the Delaware & Hudson, is one of the great coal carrying roads. The lumber is consumed in the shipbuilding activities which owe their existence to the creek. The commerce of the port reached a minimum in 1908, when it amounted to 438,000 tons. It has since gradually increased until in 1912 it amounted to 583,775 tons; and while this is only about 25 per cent of the commerce handled in the palmy days of the Delaware & Hudson Canal, shippers claim that they are hampered by insufficient depth, and further allege that the type of boat employed in barge traffic has radically changed, that competition in the selling of coal and building materials has become so keen that business is done on a very small margin, and that unless a shipper is able to take advantage of every favorable transportation feature, he can not, except under special conditions, secure a market for his product.

III. SAVING ON BASIS OF EXISTING COMMERCE.

20. At the informal hearing given interested parties, and in the inclosures herewith, many reasons were adduced why an adequate deepening of the creek would have a beneficial effect on existing commerce, and special reference was made to the increasing dimensions of towed barges, the necessity for lightering part of the traffic which now enters the creek, and restrictions on steamboat navigation caused by shoaling in the creek.

21. *Lumber.*—Two shipbuilding companies (see inclosures 2 and 4) and one lumber dealer (see inclosure 10) report using 8,000,000 feet b. m. of timber per year, and the total reported tonnage in lumber for the creek shows imports of about 15,000,000 feet. The quantity reported by shipbuilding interests is practically all yellow pine from southern ports, and is carried to New York City in coasting schooners or steam freighters drawing 14 to 18 feet. It must now be lightered at New York, making an increase of cost at the Rondout yards variously reported by dealers at from $1 to $2 per thousand. Taking the mean of these figures, we would have a saving on 8,000,000 feet of $12,000 were it possible to deliver direct by schooners. Correspondence with coastwise steamship companies and shippers (inclosures 11 and 12) indicates that with the present volume of business coasting steamers could not be employed economically in this trade in competition with schooners; but it seems obvious that with adequate channel conditions the use of steamers in this trade, to its further advantage, hinges solely upon the volume of business to be developed.

22. *Other freight.*—In inclosure 7 it is estimated that the cost of handling freight from the Hudson River Bluestone Co.'s wharf could be lessened 40 per cent if barges carrying 600 tons could be loaded there instead of the present type of boat of 250 tons burden. This company handles about 15,000 tons annually with a charge per ton of 18 cents. The estimated saving on this tonnage would be $15,000 \times \$0.18 \times 40 = \$1,080$.

In the same inclosure it is also estimated that the saving on the tonnage of the North River Stone Co. would be from 3 cents to 5 cents per

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ton. Taking the mean of these, the saving on the present output of this company would be 175,000 × $0.04 = $7,000.

As the conditions which govern the shipment of crushed stone are practically the same as those governing other heavy bulk commodities, it is reasonable to assume a like saving thereon; and on the total coal, ice, and cement reported in paragraph 18 the saving would be 423,350 × $0.04 = $16,934, and the total combined saving on lumber and other classes of bulk freight would be $12,000 + $1,080 + $7,000 + $16,934, or $37,014, equal to the annual interest at 4 per cent on an investment of $925,000.

23. *Additional considerations.*—Grounding of packet steamers carrying passengers and freight with consequent delays and uncertainties adversely affecting this class of commerce is referred to in inclosures 1, 5, and 7. Another important item not included in the above, but which would afford shipping companies a saving and be of great convenience to them, is the fact that a channel of sufficient depth would allow boats of any size entering the creek to be repaired at the local dry docks, which have a capacity largely in excess of the present govering depth in the channel leading to them. An example of a saving to result from such a change is cited in the statement in inclosure 5 that the steamer *Poughkeepsie* unshipped her rudder by striking a shoal at the mouth of the creek and had to be towed to New York for docking, although the dry dock at South Rondout was only about 1 mile away and of ample capacity for her.

24. *New project justifiable.*—All the foregoing statements indicate that the yearly saving on the basis of the existing bulk freight alone in the creek would justify the expenditure of the funds necessary to complete a comprehensive project. The beneficial effect of an improvement on the shipyards which, according to inclosure 4, is expected to result at one yard in an increase of business of 20 per cent, and on the traffic in general merchandise which should be benefited by the increased reliance which may be placed on the arrival and departure of steamers through their independence of tidal conditions, can not be directly expressed in terms of money, but is none the less real and substantial. Moreover, as will be discussed more in detail, it seems reasonable to assume that a saving on existing commerce must result in an increase in its volume to the ultimate net benefit of the body of taxpayers.

IV. POSSIBILITIES OF FUTURE COMMERCE.

25. *Coal.*—In view of the character of the commerce handled and the proximity to the New York market there is every indication that the commerce of the creek will increase after improvement. Rondout Creek at one time had the largest commerce of any inland port in the United States, due largely to the immense amount of coal handled, 2,000,000 tons per year. After the railroad boom in the eighties the railroads in their strenuous competition for business and through their efforts to control all means of transportation, gradually diverted traffic from the waterways until at present their lines are at times congested, and through the possibilities of improved water transportation there is a growing tendency to handle bulk and even package freight by water. As a single example it is reported that an offer to ship 400,000 tons of coal was refused by the North River Coal Co.

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last season solely because navigation conditions in Rondout Creek were such that this coal could not be handled in sufficiently large cargoes to make the business profitable.

26. *Crushed stone.*—In inclosure 6 the North River Stone Co. reports having doubled the capacity of its crushed-stone plant during the past year until it now has a capacity of 2,500 tons per day. With good business conditions and no navigation hindrances to free competition in the New York market this plant should ship 300,000 tons yearly for use in building and engineering construction in Greater New York.

27. *New industries.*—In inclosure 3 the establishment of a rubber factory, provided accommodations are provided for coastwise vessels, and a development of the extensive sand banks on the south side of the creek are possibilities of the near future.

28. *Summary.*—There are industries along this creek capable of unlimited development and there is ample room for the housing of new industries. From statements of shippers and the healthy growth of existing commerce during the past five years and in view of the fact that shippers see a wider market which would be open to them if more adequate transportation facilities were provided there is every reason to believe that an adequate improvement would be followed by increased output of present industries and the location of new industries for which the creek is adapted. But, above all, it is anticipated that the opening of the New York State Barge Canals will result in a very great increase in general freight traffic on the Hudson River by which all of the river ports will be affected; and being the present center of the towing business on the river, Rondout seems to be in a position to take the lead in assisting this commerce into being and to benefit by it accordingly.

V. SCOPE OF PROJECT.

29. *Introduction.*—Having shown that improvement at a considerable cost is justifiable economically on the basis of benefit to existing commerce alone, it remains to determine the character and scope of the particular betterment to Rondout Creek which will prove most advantageous to the people of the United States. Under the conditions obtaining this will depend on the dimensions of the craft already using the harbor and the dimensions of existing and prospective craft plying connecting waterways whose sphere of operations it is desired to extend to the creek. However, in formulating this project the ample justification for a large expenditure which has been found to exist solely upon the basis of the saving to existing commerce should be borne in mind; and therefore within this limit of cost it seems advisable to adopt at this time a project broad enough in scope to provide for all probabilities of future growth now reasonably apparent, but a project to be carried into execution in successive steps as required to meet the necessities of the growing commerce as they arise. By this means there will be obviated the delays and direct and indirect cost incident to future examinations and surveys which otherwise would be necessary to initiate work now foreseeable and known to be financially justifiable but not required immediately; and an opportunity will be had to carry the work into execution at whatever rate may prove most profitable in ultimate net saving to the taxpayers.

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30. *Correlated waterways.*—As was stated in the report on the preliminary examination (paragraph 24), Rondout Creek is in commercial relations with two great waterway systems, the lower Hudson and the Barge Canal System of the State of New York, nearing completion, with outlet in the upper Hudson River. The present project for improving the upper Hudson provides for a depth at lowest stage of 12 feet, which is also the limiting depth of the barge canals, but it is expected that the most economical draft for navigating the canals will prove to be about 10½ feet. However, an extensive business in ice, oil, and other commodities is carried by the Hudson chiefly in the tows which now change tugs at Rondout, and for the carriage of this local business the present tendency is toward the adoption of the high-sided barge or scow common in the lower river and its connections, and these boats are frequently worked on a draft of 12 feet or more when practicable. Due to the tidal range, such a draft can be carried in the upper Hudson on the completion of the present project for its improvement, except during brief periods of extreme low water. Consultation with shippers discloses that a large percentage of the commerce of the port travels to and from the lower Hudson, New York Harbor, and Long Island Sound waters, and it is believed that any project for this improvement should provide an adequate channel and maneuvering space through the most used section of the creek for the types of vessels now using or being developed for use on these waters.

31. *Probable types of craft.*—By far the greater part of the commerce affecting Rondout is carried by towed barges. Accordingly, in order to ascertain the most favored types of craft now in use for this class of business on the connecting waterways and the probable tendencies as to future construction a canvass of the United States Engineer offices located along the northeast Atlantic coast, Long Island Sound, and New York Harbor waters and towing companies operating on these waters was made with a view to determining:

(*a*) Dimensions and draft of tugboats of the type most favored by towing companies.

(*b*) Dimensions and draft of towboats of maximum size.

(*c*) Dimensions and draft of towed barges of the type most favored.

(*d*) Dimensions and draft of towed barges of maximum size.

(*e*) Present tendencies as to draft of the above classes as evidenced by recent or projected construction.

32. *Dimensions of tugs and barges.*—The results of this inquiry are compiled in the following table:

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Informant.	Navigating waters of—	(a) Most favored size of towboat.			(b) Maximum size of towboats.			(c) Most favored size of barges.			(d) Maximum size of barges.			(e) Construction tendencies.
		Length.	Width.	Draft.	Length.	Width.	Draft.	Length.	Width.	Draft.	Length.	Width.	Draft.	
		Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	
Moran Towing & Transportation Co.	Hudson River	.....	.....	8-12	.....	.....	15-16	.....	.....	8-11	.....	.....	16-18	
New York district No. 3.	Harbor	70- 80	15-25	6-10	.....	.....	12-16	80-150	20-30	6-16	.....	.....	25-27	Increase.
New London district.	Sound	.....	.....	.....	125-135	24-27	16-17	100-130	25-30	12	200-300	40-50	21-26	Stationary, large sizes.
New York Central & Hudson River R. R.	Harbor	90-125	20-26	9-13½	140	30	15	100	30	[1] 3- 6	337	40	[1] 5	Stationary.
Pennsylvania R. R.	.....do	105	23½	10½	118	32½	13	99	31	8	101	34	9½	Do.
Dock Commission New York City.	.....do	.....	.....	8-12	.....	.....	15-16	.....	.....	8-11	.....	.....	16-18	
Boston Towboat Co.	Ocean	160	.....	16	175	.....	17	.....	.....	.....	[2] 4,000	.....	24	
Commercial Towboat Co.	Ocean and harbor.	85- 90	20-21	9-10	105	22	13	[2] 1,500	.....	17	[2] 5,000	.....	29	
Lehigh Valley R. R.	.....do	105-115	25-27	12	152	29½	16	.....	.....	[1] 3- 8	.....	.....	15-19	Stationary.
Standard Oil Co.	Hudson River	105	18	11½	105	18	11½	270	40	11½	270	40	11½	Limited by channel depth.
Cornell Steamship Co.	.....do	135	.....	13	150	.....	14	110	33	12	.....	.....	.....	
Staples Transportation Co.	Ocean	150	26	15	165	29	17	196	36	17	283	46½	20	Increase.
Providence Towboat Co.	.....do	135	27½	15.7	[3] 189.3	39.3	20.1	256	43	20	300	49.1	19.9	

[1] Includes car floats.

[2] Tons burden.

[3] "Paul Jones."

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33. *Most favored type.*—From the above table, and from consultation with officials of the Cornell Towing Co. (as stated, the largest on the river), and with shipbuilding interests, it appears that, disregarding craft constructed solely for long distance towing at sea, the most favored types of craft employed in the handling of bulk freight where there is ample water, are towboats drawing from 12 to 15 feet, and barges with 15 feet sides loaded to a draft of about 13 feet.

34. *Navigation conditions.*—Navigation in the creek is governed by conditions differing from those obtaining in an open river. Rondout Creek is in the nature of a long terminal slip with low current velocities except during freshets, and in it vessels do not operate at a high rate of speed. The channel is somewhat tortuous, still further limiting the speed of vessels, and in consequence decreasing the necessary width of fairway.

35. *Turning basin.*—At present the turning of the larger vessels is usually done while lying at their wharves and after unloading, so there seems to be no present necessity for a large turning basin. But owing to the general narrowness of the creek, and in anticipation of an increase in commerce it is believed that the project should provide for ample manuevering ground to be created by widening the channel where possible from time to time as the conditions of traffic warrant.

36. *Draft.*—As suggested by paragraph 33, the draft of towboat that seems most likely to prevail in the near future is 15 feet for the lower Hudson and 12 feet for the upper Hudson, and of barges, 14–15 feet and 10 feet for the two sections respectively. With the limitations as to speed which prevail in the harbor, the "squat" of such craft when under way in the creek should not exceed 1 foot, making the gross draft of the larger vessels about 15 feet.

37. *Depth at mean low water.*—The difference between the adopted plane of mean low water and the probable plane of frequently recurring lowest stage is about 2 feet, and the water level at low water approaches this latter stage whenever the wind blows for two or more successive days from the north and northwest. Hence, in view of the character of vessel now employed in the large present and prospective commerce of the creek, and in order that the regular scheduled daily operations may not be interrupted, it is believed that a depth of 18 feet at mean low water should be provided which would insure a depth of 15 feet at all stages, and still allow a small margin for channel deterioration and for safety.

38. *Width.*—Bearing in mind the statements in paragraph 35, relative to the need of turning basins and maneuvering space, and opinions expressed in inclosure 5, a channel width of 200 feet would appear to be sufficient for the immediate accommodation of the regular passenger steamers and barges, and would enable them to turn when light at their docks; and as, on account of the limitations on shipping as outlined in paragraph 34, barges are always towed on very short hawsers, such a width would also provide sufficient room for passing tows. Further, in the channel above the Wilbur Bridge, it is believed that owing to the small number of boats of deep draft which have occasion to operate there, a channel width which would allow a boat in tow to pass another tied to a wharf would be sufficient for all commerce in this section now foreseeable, and this width is estimated at 100 feet.

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39. *Summary—Scope of project.*—Epitomizing, the project should provide:

(1) For a channel 18 feet deep at mean low water and of adequate width for navigation by "down-river" craft, extending to all portions of the creek where the banks are now used or seem likely to be used in the near future by important industries.

(2) For a channel depth of 12 feet at mean low water, suitable for "up-river" and barge canal craft to be extended when necessary to the head of navigation at Eddyville.

(3) For making available when necessary for the maneuvering of down-river craft, all space available in the portion of the harbor opposite the principal wharves. This would require the widening of the 18-foot channel to the greatest amount practicable between Reference 4+000 and Reference 7+000 (sheets 1 and 2).

(4) For the immediate construction of a channel 200 feet wide and 18 feet deep at mean low water from deep water in the Hudson River to the deep water at Reference 11+600 (sheet 3) near the West Shore Railroad bridge and 100 feet wide and 12 feet deep at mean low water from there to the coal wharf at Reference 17+400 (sheet 4).

VI. PROJECT.

40. *Definition and cost.*—In accordance with the foregoing the limits and depths of the proposed channels are shown on the accompanying chart, the portion recommended for immediate execution being outlined by heavy lines. East of Reference 11+600 (sheet 3) all excavation is to be carried to a depth of 18 feet at mean low water and west of that reference to 12 feet at mean low water. As will be described hereinafter the immediate construction of certain diking as indicated is believed to be necessary for channel maintenance and as an assistance in the disposal of spoil from the dredging. The cost of the project at unit prices, to be discussed later, is estimated as follows:

Portion for immediate execution.

660,000 cubic yards common excavation, at $0.25	$165,000
4,000 cubic yards rock excavation, at $10	40,000
Diking required	5,000
Engineering and contingencies, about 20 per cent	42,000
	252,000

For widening and extending channel when necessary.

240,000 cubic yards common excavation, at $0.25	$60,000
Engineering and contingencies, about 20 per cent	12,000
	72,000

RECAPITULATION.

For portion of project to be executed at once	$252,000
For portion of project to be executed subsequently	72,000
Total estimated cost of project	324,000

41. *Character of material.*—The material to be dredged is believed to be sand and silt and it is believed can be removed easily and disposed of economically by a hydraulic dredge. The areas upon which it is proposed to dispose of this spoil are indicated on the accompanying maps. None of them would require the use of an extreme length of pipe line. For the section east of Reference 7+000 (sheets 1 and 2) this material can be pumped behind the existing

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dikes or where there is none behind or around dikes or levees to be constructed as part of this improvement.

42. *Tributary stream.*—There is only one stream of any magnitude tributary to the tidal portion of the creek. It is known locally as South Rondout Creek and enters Rondout Creek from the south near Reference 9+000 (sheet 2). This tributary is characterized in its upper course by considerable scouring of its banks and the removal downstream of a comparatively large amount of sand. However, this occurs only in times of freshet or heavy rainfall, when similar conditions exist in the main stream and a comparison between the results of the present survey and a survey made by the State of New York in 1890 shows no considerable shoaling near the mouth of the tributary during that period. Hence it is not believed that its outlet need be altered.

43. *Regulating works required.*—There are three localities, viz, from Reference 4+620 to 5+030 (sheet 1); in the vicinity of Reference 6+250 (sheet 2); and from Reference 8+100 to 9+200 (sheet 2), where existing dikes should be repaired or reconstructed or some sort of revetment or diking should be constructed to serve as shore protection and as a bulkhead behind or about which material dredged from the channel may be deposited. Further these constructions should assist materially in maintaining the dredged channel, especially at the two localities east of Reference 6+600, where they will prevent the set across the channel of the flood tide which passes in from the Hudson River across the flats and will confine the ebb tide in the creek. Existing dikes have proven their usefulness in maintaining a channel through the bar at the mouth of the creek, but do not exercise their full potentiality by reason of the ebb discharge that is diverted through the gaps east of Reference 6+250.

44. *Proposed types.*—Between Reference 4+620 and Reference 5+030 there is an existing dike composed of a single row of round piling. This dike was originally backed with rubble stone which made it a comparatively tight structure, but the action of steamboat waves has gradually withdrawn the stone through the spaces between the piles until it is now entirely removed and the dike affords a clear passage for the tides. It is proposed to supplant this section of old diking, if a new project be adopted, by driving a line of single sheet piling connecting the Hudson River Day Line wharf with the present stone-filled dike, as shown on Sheet No. 1, and using the piling as a core for a fill of dredged material which will confine the waters of the creek to the elevation of mean high water. The cost of this work and the placing of sufficient riprap to protect the exposed face of the fill is estimated at $5,000.

To maintain a channel in the vicinity of Reference 5+500 to Reference 6+600, it will be desirable to build a dike along the south shore of the creek to prevent scour and the deposit of the scoured material in the open channel thereby causing shoals which will necessitate frequent redredging. This dike will be also used for retaining material which is to be dredged from the proposed channel. The estimated cost is about $21,000.

It will be also necessary to utilize the flats on the south side of the creek from Reference 8+100 to Reference 9+200 as a spoil bank for dredged material. As this spoil is on the concave or bend side

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of the stream it will have to be protected from erosion. Here again alternative designs for dikes are proposed. These would comprise either a dike of the standard sheet pile type or a brush or sod revetment or levee that would confine the discharge of the dredge until the suspended material had time to settle. The latter type, however, is recommended for adoption, and in view of the value of the fill to the riparian owners the construction of the levee should be made a part of the cooperation required of local interests. The estimated cost of the dikes required here is about $2,000.

45. *Dredging.*—For an 18-foot channel, 200 feet wide from the Hudson River to Reference 11+600, the volume of the neat prism to be removed, computed from the soundings taken and including 1 foot overdepth and side slopes of 1 on 4, is 550,000 cubic yards. From experience had in dredging of a similar character in the Hudson River the uncertainties existing as to the amount of material which must be handled actually to secure the cross section desired and changes which may take place indicate that the project should provide for the removal of an amount about 20 per cent in excess of the neat volume of the prism as now computed or 660,000 cubic yards for the channel up to Reference 11+600. By a similar method of reasoning the amount of material for which removal should be provided to secure the maneuvering ground in the lower harbor and the 12-foot channel to Eddyville is estimated as 240,000 cubic yards. However, in view of the relatively small quantity and the fact that the work is to be done at some indefinite date in the future when labor and other conditions may have changed materially, it is believed that this part of the work should be estimated for at a slightly higher unit price. The amount of diking to be done will have an effect upon the unit price of the dredging, because it is proposed to utilize the available areas behind these dikes as spoil banks. Conditions governing dredging in the creek are very favorable, being practically independent of weather conditions and all the work is concentrated in short reaches having spoil areas within easy distances. The amount to be done immediately would provide about one season's work of about 9 months for a 16-inch hydraulic dredge. Allowing a daily operating charge of $400 per working day the total cost for about 9 months would be $90,000 or about 14 cents per cubic yard, which represents a possible cost of the work if done by Government dredges. In the project the estimated cost of this work is given as 25 cents per cubic yard, this price being believed sufficient to make ample allowance for contractors' profits in case the work is done by contract, as well as for unforseen conditions, as for example the unavailability of the Government's Hudson River plant for this work.

46. *Rock.*—The rock to be removed is confined so far as known to one small ledge near Reference 9+500 (sheet 2) and to the outer edge of a ledge at the foot of the bluff at Reference 8+000 (sheet 2). While the quantity of rock to be removed from these ledges is estimated as not to exceed 2,000 cubic yards, it seems probable that other isolated small ledges may be developed by the dredging, and accordingly it seems advisable to provide for the removal of a total of 4,000 cubic yards of rock. The cost of removal in 1913 of a small ledge of rock in Saugerties Creek, 11 miles north of Rondout Creek, in amount about 330 cubic yards, was $11 per cubic yard. It is believed that if the work of rock removal is combined with the

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dredging, the cost per cubic yard will not exceed $10, and this price has been used in the estimate.

47. *Power development.*—There are no practical possibilities of power development, for although the old Delaware & Hudson Canal Dam at Eddyville is reported to give a fall of 12½ feet at mean low water, the volume of discharge of the creek, according to the Report of Progress of Stream Measurements for the calendar year 1905, published by the United States Geological Survey, exclusive of the slight amount diverted through the canal, has fallen as low as 62 cubic feet per second and the possible development would be too small to be of economic utility.

48. *Terminal facilities.*—The existing terminal facilities are described in paragraph 23 of the report on preliminary examination. In general they are efficient and adequate for present commerce. A large part of the past commercial history of this stream centers about the now abandoned island dock (Ref. 9+000, sheet 2). In the days when the Delaware & Hudson Canal was in operation this formed a storage area for coal brought from Pennsylvania through the canal in the very small boats it was possible to take through the canal owing to the inclined planes in its course. This coal was stored in high piles awaiting shipment to destination in the standard barge of about 250 tons. This dock provides another excellent location for a freight transfer terminal in the creek should future developments ever require it, and if the local interests desire, the channel or slip on the north side separating it from the main land can be filled with material dredged from the creek. However, the protected water north of the dock is now entirely used each winter for laying up river craft, and its value for this purpose is so great as to render extremely doubtful the advisability of filling it.

49. *Expenditures.*—There has already been expended by the United States in the construction and maintenance of a channel and protecting works through the alluvial bar at the mouth of the creek about $160,000, but no money has ever been expended on improvement of the inner harbor or creek. Adding the interest charges to the United States on the money invested in the present project and on the total expenditure now proposed, and adding an assumed annual maintenance charge on both the proposed and present projects, we have—

Annual interest on $160,000, at 3 per cent	$4,800
Annual interest on $324,000, at 3 per cent	9,720
Annual charge for maintenance	6,000
Total	20,520

which is well under the estimated future saving of freight charges on the basis of even part of the existing commerce as shown in paragraph 22.

50. *Cooperation.*—Considering the great benefit to be derived locally from this project, it is believed that the local interests should cooperate with the United States in securing spoil banks free of cost and the construction of the dike referred to in paragraph 44 from Reference 5+500 to 6+600, together with a sod or brush levee from Reference 8+100 to Reference 9+200. Not only will the dike and levee be a great benefit to local interests in so far as navigation is concerned, but if the lands behind them can be used as spoil banks about 16 acres of land, which has small present value, will be rendered available for commercial uses.

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The cost of the dike and the levee is estimated at about $23,000 and represents the amount that it is believed local interests should contribute toward the improvement, a matter of about 7 per cent of the total estimated cost of the project as recommended. These interests should also secure for the United States the right to deposit dredged materials on the low lands along the creek.

51. *Recommendations.*—From the investigations made as reported upon above, it is my opinion that Rondout Harbor and Creek are worthy of future improvement by the United States, provided local cooperation can be secured to the extent of $23,000 in cash and the authorization to deposit dredged materials as stated in paragraph 50, and subject to the above provisions, it is recommended:

That a channel be provided 18 feet deep at mean low water from deep water in the Hudson River to the deep water at Reference 11+600, near the West Shore Railroad Bridge, and thence 100 feet wide and 12 feet deep at mean low water to the coal wharf just below the highway bridge at Eddyville, the latter channel to be extended to the head of navigation at the dam at Eddyville, when such extension is deemed necessary in the interests of commerce; also for widening the channel between Reference 4+400 to Reference 7+000 with a depth of 18 feet at mean low water, as indicated on sheets Nos. 1 and 2, to afford space for the maneuvering of vessels.

These channels to be protected by such regulation works and bank revetment as may be necessary, which, as stated in paragraph 44, shall consist of dikes and a levee. The cost of the proposed improvement is estimated at $324,000 for construction and an annual estimated cost of $6,000 for maintenance.

52. Until a navigable channel of the proposed depth has been provided up to the coal wharf, the benefit to commerce will not be in proportion to the amount heretofore expended in making the improvement. It is believed, therefore, that the work should be completed within a period of three years and that an initial appropriation of $100,000 should be made with continuing contract authorization to the amount of $100,000.

W. M. BLACK,
Colonel, Corps of Engineers.

[First indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
November 24, 1914.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. It is recommended that the papers be returned to the district officer with request for additional estimates for channels as follows:

18 feet by 200 feet from entrance to Broadway.
15 feet by 200 feet from entrance to Broadway.
18 feet by 200 feet from Broadway to West Shore Bridge.
15 feet by 150 feet from Broadway to West Shore Bridge.
12 feet by 100 feet from Broadway to West Shore Bridge.
12 feet by 100 feet from West Shore Bridge to upper end of proposed improvement.

All channels to include suitable widenings at bends.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

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[Second indorsement.]

OFFICE, CHIEF OF ENGINEERS,
November 30, 1914.

To the DISTRICT ENGINEER OFFICER, FIRST DISTRICT,
New York City.

Inviting attention to the preceding indorsement by the Board of Engineers for Rivers and Harbors, it is requested that the information called for therein be furnished for the use of the board.

By command of the Chief of Engineers:

H. TAYLOR,
Lieut. Col., Corps of Engineers.

[Third indorsement.]

DISTRICT ENGINEER OFFICE, FIRST DISTRICT,
New York City, December 30, 1914.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. Returned.

2. In the memorandum herewith are stated the costs of the six channels asked for by the Board of Engineers for Rivers and Harbors. The channels appearing as Nos. 1, 3, and 6 therein, taken together, are identical with that portion of the project stated for immediate execution on page 12 of my report, foregoing. The total of the three channels differs slightly from the total stated at the bottom of page 12 of my report referred to, due to a difference in the amount allowed for contingencies. The costs per cubic yard for dredging and for rock excavation and the diking needed are identical with the costs of those items as stated in my report.

3. It has been found that a discrepancy exists in the reference to datum planes as contained on page 2 of my report and in paragraph 3 of the notes appearing on each of the charts accompanying the report. It is requested that the figure 1.60 appearing in paragraph 2 of the notes on the charts be changed to 1.58, a similar change having been made on the retained copies of the charts on file here.

W. M. BLACK,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors on Survey, see p. 3.]

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Estimates for channels as per first indorsement, Rondout survey report.

No.	Channel dimensions.	From—	To—	Excavation (cubic yards).				Diking.	Add 20 per cent for engineering and contingencies.	Total cost.
				Soft material, at 25 cents.		Rock, at $10.				
				Quantity.	Cost.	Quantity.	Cost.			
	Feet.									
1	18 by 200	Entrance	Broadway	261,600	$65,400			$5,000	$14,080	$84,480
2	15 by 200	do	do	105,900	26,475			5,000	6,295	37,770
3	18 by 200	Broadway	West Shore bridge	371,400	92,850	4,000	$40,000		26,570	159,420
4	15 by 150	do	do	159,000	39,750	1,000	10,000		9,950	59,700
5	12 by 100	do	do	35,000	8,750	200	2,000		2,150	12,900
6	12 by 100	West Shore bridge	Eddyville	25,000	6,250				1,250	7,500

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LETTER OF MR. WILLIAM HILTEBRANT.

KINGSTON, N. Y., *March 22, 1915.*

GENTLEMEN: I am very much interested in the proposed improvement to Rondout Harbor of which you speak in your letter of February 24. It is to be regretted that such improvements as are now contemplated were not made before this, as we have here the only navigable stream and also the best harbor along the Hudson River. In my opinion, I think that there should be a channel of at least 18 feet in depth below the West Shore Railroad bridge and 12 feet above at high water. While this would not give the depth we should have, it would in a measure relieve present conditions. The need of these improvements is great and should not be any longer deferred.

Yours, truly,

WM. HILTEBRANT.

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

LETTER OF KNICKERBOCKER ICE COMPANY.

KNICKERBOCKER ICE CO.,
New York, March 1, 1915.

GENTLEMEN: Referring to your circular dated February 24, beg to say that in our opinion the depth of water in Rondout Harbor is sufficient for all requirements of commerce and trade at that point.

We, therefore, do not approve of the expenditure by the Government of further sums at that place at present, and are unwilling to contribute for the same, as we believe the expenditure unnecessary and unprofitable.

Yours, very truly,

HENRY C. HARRISON, *Secretary.*

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[First indorsement.]

DISTRICT ENGINEER OFFICE, FIRST DISTRICT,
New York City, March 5, 1915.

To the BOARD OF ENGINEERS FOR RIVERS AND HARBORS:

Transmitted.

W. M. BLACK,
Colonel, Corps of Engineers.

LETTER OF C. HILTEBRANT DRY DOCK COMPANY.

C. HILTEBRANT DRY DOCK CO.,
South Rondout, N. Y., March 22, 1915.

GENTLEMEN: Re "Rondout Harbor, New York, from the Hudson River to the head of navigation."

Replying to above subject would say that we believe a channel 18 feet deep at high water and 200 feet wide up to the West Shore Railroad Bridge, and 12 feet high water and 100 feet wide thence to Eddyville, will be sufficient water. This is 4 feet less in depth than your estimate.

There is some necessary dredging that should be done in Rondout Creek. We have a dry dock sufficient for getting 17 feet of water on top of keel blocks, and could dock a number of vessels from along the Hudson River if there was sufficient water to allow them to get to our plant. We quite frequently turn work away for this reason.

We trust that something will be done to improve conditions here.

Yours, truly,

C. HILTEBRANT DRY DOCK CO.,
F. J. WALTER, *Secretary.*

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

LETTER OF CORNELL STEAMBOAT COMPANY.

CORNELL STEAMBOAT CO.,
New York, March 12, 1915.

DEAR SIR: Replying to your letter of February 24, signed by Lieut. Richard T. Coiner, I beg to advise we have forwarded copies of the circular dated Washington,

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D. C., February 24, to the following: Knickerbocker Ice Co., Hudson River Day Line, Central Hudson Steamboat Co., Hiltebrant Dry Dock Co., John D. Schoonmaker, North River Stone Co., North River Coal Co., Ulster & Delaware Railroad Co., Dwyer Brothers, William J. Turck, Calvin Tomkins, Jacob Rice, Daniel Zoller, Watts & Tammany, Kingston Gas & Electric Co., The chamber of commerce of the city of Kingston, The mayor of the city of Kingston.

Second. In connection with the subject of this circular, and after an examination of the plan recommended for the improvement of Rondout Creek, I am of the opinion that the requirements of commerce would be served by providing a channel 14 feet in depth at low water instead of the 18-foot depth named in the project. The delays to deep-draft vessels would not seem to be of sufficient importance to warrant the necessary expenditure by the Government to avoid this condition.

Third. I note that the circular calls for interested parties to send their statements to the Board of Engineers at Washington.

Will you please advise if in addition to this letter we should write to the board at Washington to express our views in relation to a modification of the project.

Yours, truly,

CORNELL STEAMBOAT CO.,
FREDERICK COYKENDALL, *President.*

Col. W. M. BLACK,
Corps of Engineers.

[First indorsement.]

DISTRICT ENGINEER OFFICE, FIRST DISTRICT,
New York City, March 18, 1915.

To the BOARD OF ENGINEERS FOR RIVERS AND HARBORS:

1. Forwarded for consideration in connection with previous papers in the matter of the survey of Rondout Harbor, N. Y.

2. Attention is invited to copy of my letter herewith answering the query of the writer of the foregoing letter contained in the last paragraph thereof.

W. M. BLACK,
Colonel, Corps of Engineers.

LETTER OF COL. W. M. BLACK, CORPS OF ENGINEERS.

UNITED STATES ENGINEER OFFICE, FIRST DISTRICT,
New York City, March 18, 1915.

DEAR SIR: I have to acknowledge receipt of your letter of March 12, 1915, in the matter of project for the improvement of Rondout Harbor, N. Y., and have forwarded the same to the Board of Engineers for Rivers and Harbors at Washington, D. C., for consideration. It is unnecessary, therefore, for you to send another letter containing the same information to the board.

Very respectfully,

W. M. BLACK,
Colonel, Corps of Engineers.

Mr. FRED COYKENDALL,
President Cornell Steamboat Co., New York City.

LETTER OF R. LENAHAN CO.

R. LENAHAN CO.,
Kingston, N. Y., March 11, 1915.

GENTLEMEN: We would recommend that the Rondout Creek be modified as follows: 14 feet deep, 200 feet wide to the West Shore Railroad bridge, and 10 feet deep, 100 feet wide thence to Eddyville. The above depth to be at mean low water.

We consider this improvement very necessary and much wanted by the traffic here, but it does not appear to us that it should cost anything near the figure stated in your letter.

We consume about one and one-half million feet yellow-pine timber per annum, which comes principally from ports along the Atlantic, and Gulf ports.

Trusting that the improvements referred to will be made soon, we beg to remain,

Very truly, yours,

R. LENAHAN CO.

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

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LETTER OF NEW YORK CENTRAL & HUDSON RIVER RAILROAD CO.

NEW YORK CENTRAL & HUDSON RIVER RAILROAD CO.,
New York, March 10, 1915.

GENTLEMEN: Notice to the New York Central Railroad and the West Shore Railroad concerning proposed improvements of Rondout Harbor has been received.

Should the board be convinced of the advisability of undertaking the improvement this company will not oppose the decision, but will ask that the channel 18 feet deep and 200 feet wide be stopped at a point sufficiently below the West Shore bridge to protect the foundation. This simply means that the channel 12 feet deep and 100 feet wide which is to extend from the West Shore Bridge to Eddyville be carried to a point say 200 feet east of the bridge, thus dredging the shallow and narrow channel between the bridge piers instead of the deep and wide one.

Yours, very truly,

A. T. HARDIN.

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

LETTER OF CENTRAL-HUDSON STEAMBOAT CO.

CENTRAL-HUDSON STEAMBOAT CO.,
Newburgh, N. Y., March 9, 1915.

GENTLEMEN: We are in receipt of public notice No. 1623/21, under date of February 24, 1915, in regard to improvement of Rondout Harbor, N. Y., from the Hudson River to the head of navigation.

While we are not interested in the deepening of this channel as far as original report recommended, we are very much interested in the improvement of the channel from the mouth of the creek to our storehouse, which is located immediately west of the chain ferry.

This company operates a line of passenger and freight boats between New York and Kingston or Rondout and make daily trips in and out of this creek through the season of open navigation. We operate propellers and, at times, they draw 14 feet of water. We have a regular schedule of sailings and arrivals at Rondout and have found in the past that our business has been greatly hampered by the lack of water at various points between our dock and the mouth of the creek. If it is extremely low water when our boats are entering the creek, or at their leaving time, it is impossible for us to wait until the tide changes, as we have certain railroad connections which we must make.

There have been several times in the past few years when our steamers have been aground, especially off the Stone Dock, where we continually drag at low water. Last June one of our steamers, in entering the creek at extremely low water, struck some submerged object on the bed of the stream and knocked a fluke off her wheel. This caused us considerable expense, as well as disarranging our regular schedule.

We feel that the business in and out of Rondout Creek warrants an expenditure by the Government to put this creek in safe navigable condition, at least from the mouth of the creek to Hiltebrant's Dry Dock. There are very few of our steamers which we can take to this shipyard at the present time, owing to a bar in the creek immediately east of their docks.

We feel that this work is a necessity and should not be longer delayed.

Yours, very truly,

CENTRAL-HUDSON STEAMBOAT CO.,
H. R. ODELL, *General Manager.*

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 391.

MONROE HARBOR, MICH.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON REEXAMINATION OF MONROE HARBOR, MICH.

DECEMBER 14, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 13, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated October 8 last, together with copy of a report from Lieut. Col. M. M. Patrick, Corps of Engineers, dated August 2, 1915, on reexamination of Monroe Harbor, Mich., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, October 8, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Reexamination of Monroe Harbor, Mich.

1. Under authority of section 14 of the river and harbor act approved March 4, 1915, there is submitted herewith for transmission

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to Congress report dated August 2, 1915, by Lieut. Col. M. M. Patrick, Corps of Engineers, relative to the project for improvement of Monroe Harbor, Mich.

2. Monroe Harbor is within the mouth of Raisin River, about 18 miles north of the city of Toledo. The existing project for its improvement provides for dredging a channel 11 feet deep at mean lake level and 100 feet wide to the city docks at Monroe, and for protecting the entrance into the lake by piers. This project was practically completed in 1872, since which time expenditures have been for maintenance. The commerce is small and has been decreasing in recent years. There are no lines of boats now running regularly to this port. The district officer is of opinion that the project should be modified by abandoning that part of the improvement above the inner ends of the piers, retaining only the maintenance of the piers and the channel from their inner ends to the lake, the channel depth to be 8 feet at low water (about 10 feet at mean lake level). The cost of this maintenance work is estimated to be about $1,000 every five years. The division engineer and the Board of Engineers for Rivers and Harbors concur in the views of the district officer.

3. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore recommend that legislation be enacted authorizing the abandonment of that part of the improvement of Monroe Harbor, Mich., above the inner ends of the piers, and limiting the project to the maintenance of the piers and of a channel 8 feet deep at low water and 100 feet wide from the inner ends of the piers to the 8-foot contour in the lake, at an estimated cost of $1,000 every five years.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 15, 1915.

To the CHIEF OF ENGINEERS UNITED STATES ARMY:

1. This report on Monroe Harbor, Mich., is submitted under authority of that portion of section 14 of the act of March 4, 1915, which reads:

and the Chief of Engineers is directed to make a report upon any other projects river or harbor, the further improvement of which under present conditions is undesirable, or in which modifications of the plans or projects should be made.

2. Monroe Harbor is within the mouth of Raisin River, about 18 miles north from the city of Toledo. The existing project, as last modified in 1872, provides for dredging a channel 11 feet deep at mean lake level and 100 feet wide to the city docks at Monroe and for protecting the entrance into the lake by piers. The total length of the channel is about 2½ miles. The project was practically completed in 1872, since which time $96,706.20 have been expended for

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maintenance. The total expenditures to June 30, 1915, amounted to $261,721.47. The present depth is about 8 feet through the entrance and 6 feet above at low water, which is about 2 feet below mean lake level.

3. The commerce reported for 1913 amounted to 2,155 tons, while the average for the past seven years has been about 7,500 tons. The district officer states there is no indication that the future commerce will be any greater than that in the recent past.

4. The investigations of the district officer lead him to the conclusion that the project should be modified by abandoning that part of the improvement above the inner ends of the piers, and limiting the work of the United States to the maintenance of the piers and of the channel from their inner ends to the lake with a depth of 8 feet, which he estimates will cost about $1,000 every five years. The division engineer concurs with the district officer.

5. It will be seen from an examination of the records that the commerce of this harbor has never been large and that its importance is decreasing. The length of river channel being maintained by the United States above the entrance is about 2 miles, and the expenditures thereon have been unduly large when compared with the commerce of the locality and the resulting benefits to navigation. It is believed that the cost of continuing this work and of maintaining the present project depth through the entrance is greater than is warranted by its prospective use. The board therefore concurs with the district officer and the division engineer, and recommends legislation authorizing a modification of the project, so as to provide only for the maintenance of the piers and of a channel 8 feet deep at low water and 100 feet wide from their inner ends to the 8-foot contour in the lake.

For the board:

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

REEXAMINATION OF MONROE HARBOR, MICH.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Detroit, Mich, August 2, 1915.

From: The District Engineer Officer.
To: Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Modification or abandonment of project, Monroe Harbor, Mich.

1. In compliance with the directions contained in the fourth indorsement, office Chief of Engineers, May 3, 1915, the following report is submitted upon the advisability of modifying or abandoning the present project for improving Monroe Harbor, Mich.

2. The harbor of Monroe, Mich., is in the mouth of the Raisin River at the western extremity of Lake Erie, about 18 miles north from the city of Toledo, Ohio. The town of Monroe, population about 7,000, lies on both banks of this river about 2½ miles from the

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lake. The docks at the town are on the south side of the river and have been regarded as the upper limit of the improvement. At this locality the river is about 230 feet wide and the bottom is of solid limestone rock. The locality is shown on map herewith and on Lake Survey chart No. 0, and coast chart No. 37.

3. Reference to previous examination or survey reports and maps or plans:

Section covered.	Congressional documents.				Annual Reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Canal and piers					[1] 1886	21
Lake and river					[2] 1872	237–231
Do					[2] 1880	2085–2086
Do					[2] 1889	2338–2344
Raisin River	House	81	Fifty-fourth	Second	[2] 1897	3094–3094
Lake and river	do	102	Fifty-fifth	do	[1] 1898	2689–2691

[1] Contains map. [2] Basis of project adopted by Congress. [3] No map.

The last report in the above table contains an estimate of the cost of obtaining a 14-foot depth of water by extending the piers, by dredging over the bar, renewing the canal revetment, and deepening the river and the artificial channel made therein at a total estimated cost of about $626,000. No specific sum was estimated for maintenance, but attention was called to the fact that this would be costly. This report was unfavorable.

4. The original project for the improvement of Monroe Harbor was adopted by act of February 24, 1835, based upon report of examination and survey made in 1834, which is not published but is referred to on page 2085 of the Report of the Chief of Engineers for 1880. It had for its object to dredge a new and direct channel 100 feet wide and 10 feet deep from the lake across the marsh, a distance of 4,000 feet, to the portion of the river ordinarily used as a harbor, the protection of the entrance into the lake by piers 726 feet long and 20 feet wide, extending outward to a depth of 10 feet in the lake, and the protection of the sides of the canal by a revetment. The estimated cost of the work exclusive of dredging machine was $55,885. The work was practically completed in 1845, a depth of 9 feet being obtained to a point just below the docks at Monroe. The piers were constructed of cribwork filled with stone, the north pier when completed being 1,350 feet long and the south pier 935 feet long. At their inner ends the piers are about 100 feet apart; they run parallel for a distance of 500 feet, when they commence to diverge, and are about 200 feet apart at the outer end of the south pier. Beginning at the inner end of the piers a canal 4,000 feet long and 100 feet wide was dredged through the marsh, and its sides were revetted with sheet piling. Subsequently the city of Monroe cut a canal across a bend of the river. This canal starts about 3,000 feet above the upper end of the United States canal, is about 1,300 feet long and 100 feet wide and about 13 feet deep. Above it the channel was dredged by the United States in the natural river bed to the docks, a further distance of about 4,500 feet.

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5. The project was modified, by the river and harbor act of June , 1872, pursuant to plan in report of survey in 1871, to a depth of . feet at mean lake level, from the lake to the Monroe docks. Esti- ated cost, $12,600. A channel of this depth up to the docks at Mon- e was secured in 1872.

6. The total amount expended on this work up to the close of e fiscal year ending June 30, 1915, was $261,721.47, of which about 10,000 was applied under the original project. It is impossible determine just what portion of the total amount expended has been plied to maintenance, but no work except that of maintenance has en done since 1872, and the expenditures since that date have ggregated $96,706.20. The two piers have been maintained by the nited States, and on the north pier there is a lighthouse and light- eeper's dwelling, this light having been established in 1849. Minor epairs were made to the piers in 1914 at a cost of $375.86. At resent the north pier is in fair condition. The timber in the super- ructure of the south pier is rather badly decayed.

7. The commercial importance of this harbor is very small. There no line of boats which runs regularly to the town of Monroe. At ne piers there is a summer resort. There is considerable pleasure oating, and into the harbor are taken small quantities of sand and onsiderable fish. Small excursion steamers run to the piers during ne summer season. The total commerce was reported for the year 913 as about 2,155 tons, valued at about $81,000, the largest single em being fish, 700 tons, valued at $75,000. There is no indication nat the future commerce will be any greater than that in the recent ast. The maximum draft that can now be carried from the lake to ne upper end of the United States canal is about 8 feet at low water, feet below mean lake level 1860–1875, and about 6 feet thence to the ty wharves.

8. The docks at Monroe city are owned by private parties, but re believed to be open to all water carriers on equal terms. There re no public docks, and it is understood that there is no public space hich can be used for building such docks. There is no physical con- ection between the water terminals and the railroads. It is believed nat there is no necessity for providing addition terminal and trans- er facilities to care for any water commerce which may be de- eloped in the future.

9. In view of the above facts it is my opinion that the existing roject for Monroe Harbor should be modified by abandoning that art of the improvement above the inner ends of the piers. These iers were built and have been maintained for many years by the nited States. They afford a sheltered entrance to the river for mall boats and are of some use in this way. If their maintenance ere abandoned they would decay above the water and might, of ourse, ultimately block the entrance entirely. It is therefore recom- ended that these two piers and the channel from their inner ends o the lake be maintained, the channel depth to be 8 feet at low ater. The cost of this maintenance work is estimated to be about 1,000 every five years.

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10. No question of the development of water power enters the improvement of this harbor.

MASON M. PATRICK,
Lieut. Col., Corps of Engineers

[First indorsement.]

OFFICE DIVISION ENGINEER, LAKES DIVISION,
Buffalo, N. Y., September 1, 191

To the CHIEF OF ENGINEERS:

Forwarded, concurring in the recommendation in paragraph the district officer's report, the channel width to be that of the pre project, viz, 100 feet.

J. G. WARREN,
Colonel, Corps of Engineers

[For Report of the Board of Engineers for Rivers and Hart see p. 2.]

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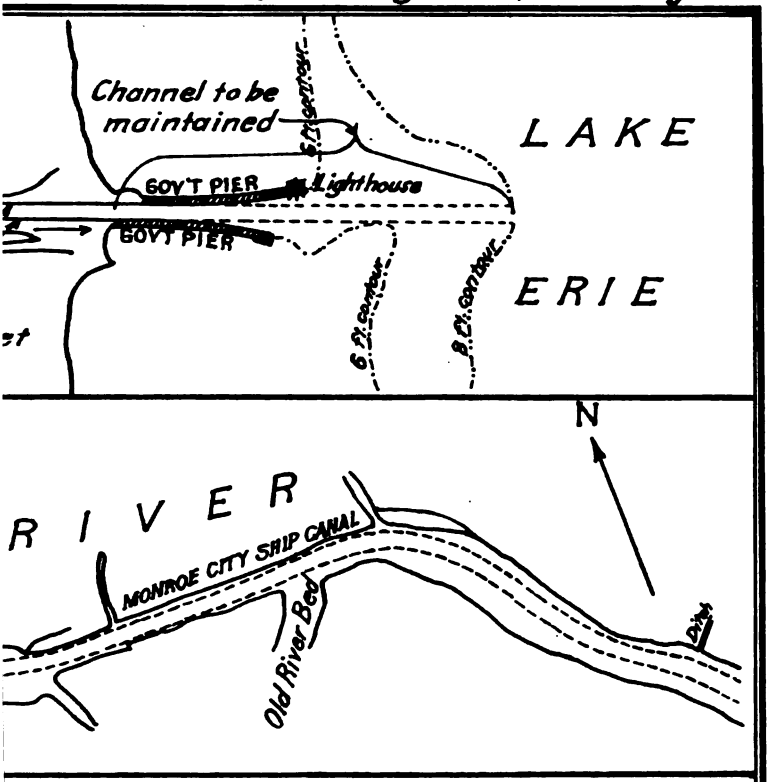
Corps of Engineers, U.S. Army.



Improvement of Harbor at MONROE, MICH.

Scale in Feet.

0 500 1000 1500 2000 2500 Ft.

Approved:

To accompany my report dated Aug. 2, 1915

Mason M. Patrick

Lieut. Colonel, Corps of Engineers, U.S. Army.

House Doc. No. ; 64th Cong., 1st Sess.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 392.

KALIHI HARBOR AND CHANNEL, HONOLULU, HAWAII.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORTS ON PRELIMINARY EXAMINATION AND SURVEY OF KALIHI HARBOR AND CHANNEL, HONOLULU, HAWAII.

DECEMBER 14, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustrations.

WAR DEPARTMENT,
Washington, December 13, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated June 1, 1915, together with copies of reports from Maj. W. P. Wooten, Corps of Engineers, dated June 5, 1913, and January 5, 1914, on preliminary examination and survey, respectively, of Kalihi Harbor and Channel, Hawaii, made by him in compliance with the provisions of the river and harbor act approved March 4, 1913; also copy of a supplemental report by Lieut. Col. C. S. Bromwell, Corps of Engineers, with map, dated November 30, 1914.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

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WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, June 1, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination and survey of Kalihi Harbor and Channel, Hawaii.

1. There are submitted herewith, for transmission to Congress, reports dated June 5, 1913, and January 5, 1914, by Maj. W. P. Wooten, Corps of Engineers, on preliminary examination and survey, respectively, of Kalihi Harbor and Channel, Honolulu, Hawaii, authorized by the river and harbor act approved March 4, 1913, together with a supplemental report dated November 30, 1914, with map, by Lieut. Col. C. S. Bromwell, Corps of Engineers, containing a modified plan of improvement.

2. Kalihi Harbor is a shallow basin west of Honolulu Harbor and connected with it by a passage known as the "Reserved Channel." It has direct connection with the ocean through Kalihi Channel, an opening of considerable depth through the reef. The district officer states that the improvement of Kalihi Harbor is desired, not for the purpose of establishing a new and distinct port, but in order to provide increased harbor facilities for Honolulu. The existing space for berthing and turning vessels has become considerably congested, and additional deep water area is needed to render the harbor safe and convenient for the maneuvering of vessels and for the establishment of additional wharves. In the report on survey the district officer submits a project for a channel 600 feet wide and 35 feet deep at mean lower low water, with a turning basin in Kapalama Basin. In the supplemental report of his successor, dated November 30, 1914, two plans are submitted for a modified project along lines suggested by the Board of Engineers for Rivers and Harbors. Each plan contemplates a channel 800 feet wide and 35 feet deep at mean lower low water, extending from Honolulu Harbor through the "Reserved Channel" to Kapalama Basin, the only essential difference being that project No. 2 provides for a wider entrance than project No. 1. The estimates are $1,535,000 for project No. 1, and $1,779,000 for project No. 2. The district officer states that a section only 1,000 feet in length should be immediately provided to meet present needs, leaving the remainder to be undertaken when required. The estimated cost of the proposed 1,000-foot section under project No. 1 is $439,000, and under project No. 2 $683,000. He recommends the adoption of project No. 2. The division engineer concurs in general with the views of the district officer.

3. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated January 27, 1915. The board concurs with the district officer and the division engineer regarding the need for increased facilities at this port, but favors the adoption of project No. 1, limiting the work for the present to the first 1,000 feet.

4. After due consideration of the above-mentioned reports, I concur in general with the views of the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Kalihi Harbor, Honolulu, Hawaii, is deemed advisable to

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he extent of providing a channel 800 feet wide and 35 feet deep at ean lower low water, extending 1,000 feet from Honolulu Harbor ong the "Reserved Channel" toward the Kapalama Basin, in cordance with project No. 1, as shown on accompanying map, an estimated cost of $439,000 for construction and $6,000 annually r maintenance. An initial appropriation of $200,000 should be ade, with contract authorization to the amount of the balance, 39,000. It is further recommended that authority be given for the rchase or construction of a Government-owned dredge, if suitable ices for the work can not be secured.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

EPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS ON SURVEY.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
January 27, 1915.

o the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is submitted in review of the district officer's ports of preliminary examination and survey of Kalihi Harbor and hannel, Honolulu, Hawaii, as authorized by the act of March 4, 13. While the purpose of the investigation called for is not clearly ated in the law, it appears from inquiries made by the district ficer that the improvement contemplated and desired is an exten- on of the present Honolulu Harbor facilities westward toward alihi Harbor through a strip of land 600 feet wide which has been ded to the United States to be used only as a navigable channel. t the Kalihi end of this channel there is a shallow basin about the e of Honolulu Harbor, known as Kapalama Basin.

2. The adopted project for Honolulu Harbor provides for an trance channel 400 feet wide and a harbor having a general width 1,200 feet and a depth of 35 feet at mean low water. At the esent time the entrance channel has a width of 400 feet, and the rbor has an area of about 3,000 by 850 feet with a depth of 30 feet more and an area of about 3,000 by 600 feet with a depth of 35 feet more. The present terminal facilities, consisting of 21 wharves, cupy nearly all available wharfage space, and the proposed exten- on of the harbor would add materially to these facilities.

3. The commerce of Honolulu has been increasing steadily and now mounts to about 1,653,000 tons, having a value of $41,859,000. The strict officer states that the resources of this territory are far from ing fully developed, that the increase in commerce may be expected continue, and that the capacity of the harbor will be insufficient meet the prospective demands upon it.

4. A survey has been made, and in the report thereon, dated nuary 5, 1914, the district officer presents a comprehensive plan improvement extending through the "Reserved Channel" into apalama Basin. Subsequently, under date of November 30, 1914, e district officer submitted a supplemental report, at the suggestion

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of the board, with estimates for a modified plan along lines proposed by the board, and this report contains his final recommendations. Two projects are presented, each proposing a channel 800 feet wide and 35 feet deep at mean lower low water, extending from Honolulu Harbor to Kapalama Basin, the essential difference being that project No. 2 provides for a wider entrance than project No. 1, as shown on accompanying map. The estimates for the completed projects are as follows:

Project No. 1:	
For construction	$1,535,000
For maintenance	12,000
Project No. 2:	
For construction	1,779,000
For maintenance	13,000

5. The district officer states that if either project is adopted a section only 1,000 feet in length should be immediately executed, leaving the remainder to be undertaken when the commerce has advanced sufficiently to justify further expenditures. On this basis the estimates are:

Project No. 1:	
For construction	$439,000
For maintenance	6,000
Project No. 2:	
For construction	683,000
For maintenance	8,000

The district officer recommends project No. 2, and believes that the first 1,000 feet will be sufficient to meet present and imediately prospective demands of commerce. The division engineer concurs with the district officer as to the advisability of the improvement, but recommends a slight modification in the lines to be followed at the entrance.

6. During its consideration of this subject, the board gave a hearing at its office on July 27, 1914, to a delegation representing local interests. The information now in hand indicates that the limited area available for wharfage and for anchorage is insufficient to meet the requirements of the commerce of this port. The number and also the size of vessels seeking business here have been increasing for a number of years, and it seems reasonable to believe that the full development of this port has not yet been reached. The plan proposed for the extension of the harbor will admit of progressive steps, as the growth of commerce justifies, and the thousand-foot extension now recommended will greatly add to the present facilities and will probably be sufficient for some years. The board does not believe there is sufficient advantage in plan No. 2 over plan No. 1 to compensate for its considerably greater cost. Moreover, if, at some future time, it is found advisable to have a wider entrance, plan No. 1 would be susceptible of such modification as may then appear necessary.

7. A careful study of conditions in this harbor leads the board to the conclusion that the United States would be justified in undertaking the work. It recommends the adoption of project No. 1, as shown on accompanying map, at a total estimated cost of $1,535,000, limiting the work for the present, however, to the first 1,000 feet, the estimated cost of which is $439,000 for construction and $6,000

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annually for maintenance. The first appropriation should be $200,000 with continuing contract authorization for the balance. It is further recommended that authority be given for the purchase or construction of a Government-owned dredge, if suitable prices for the work can not be secured.

8. In compliance with law, the board reports that there are no questions of terminal facilities, waterpower, or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

PRELIMINARY EXAMINATION OF KALIHI HARBOR AND CHANNEL, HAWAII.

UNITED STATES ENGINEER OFFICE,
Honolulu, Hawaii, June 5, 1913.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
(Through the Division Engineer.)
Subject: Preliminary examination of Kalihi Harbor and Channel, Hawaii.

1. In compliance with the river and harbor act approved March 4, 1913, a preliminary examination of Kalihi Harbor and Channel has been made, and a map[1] has been prepared by compilation from various sources. This map shows both Honolulu Harbor and Kalihi Harbor and Channel.

2. Kalihi Channel is an opening of some considerable depth through the reef, extending well in toward the shore. It is hazardous to navigate. Kalihi Harbor, the basin into which Kalihi Channel leads, has no commerce and no terminal facilities, and is very shallow and not at present susceptible of use as a harbor for even light-draft vessels.

3. A circular letter[1] was sent to all parties known to be interested in the improvement, requesting that this office be furnished with any suggestions, data or arguments tending to show the necessity for the improvement. A number of replies were received and are inclosed herewith. The subject has also been verbally discussed with those whose knowledge of local conditions is of value. From these discussions and from the replies received to the circular letter, it is evident that the improvement of Kalihi Harbor is desired, not for the purpose of establishing a new and distinct port, but merely in order to provide increased harbor facilities for the city of Honolulu. In an investigation as to the desirability of improving Kalihi Harbor, the question of the adequacy of the present harbor of Honolulu is therefore of prime importance.

4. Honolulu Harbor is situated on the south shore of the island of Oahu. The adopted project for this harbor provides for an entrance

[1] Not printed.

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channel 400 feet wide and a harbor having a general width of 1,200 feet, the depth being 35 feet at mean low tide. The estimated cost of this project was $1,628,894.60, of which $1,200,000 has been appropriated.

5. At the present time the entrance channel has a width of 400 feet; the outer 600 feet of the channel has shoaled to a depth of 33 feet, but elsewhere there is a depth of 37 feet at mean lower low tide. The harbor has an area of about 3,000 feet by 850 feet for 30 feet depth, and an area of about 3,000 feet by 600 feet for 35 feet depth.

6. Approximately 60 acres of low coral flats on the west side of the channel, known as Sand Island, have been raised to 6 feet above low water, by depositing dredged material. All of this land belongs to the United States, but while it has a harbor frontage, it can not be used under present conditions for wharfage purposes because it is separated from the mainland by a strip of land 600 feet wide, which was ceded to the United States to be used only as a navigable channel. This strip is marked on the map "Reserved Channel." Outside of "Sand Island," the entire harbor front is now occupied by wharves, with the exception of about 800 feet just north of the "Reserved Channel." Further work under the present project will not increase the harbor frontage, but is necessary to render the harbor safe and convenient for the maneuvering of vessels.

7. The terminal facilities consist of 21 wharves, of which 11 are owned and controlled by the Territory, one is owned and used exclusively by the Army, and three by the Navy. The other six are privately owned. Mechanical appliances are used for loading and unloading on most of the wharves. The only railroad entering the city has connection with two wharves.

8. Terminal and transfer facilities are open to all on equal terms.

9. The commerce of Honolulu has increased in tonnage since 1905 from approximately 665,000 tons to approximately 1,653,000 tons, and in value from $41,859,000 to $79,586,105. The commerce during the calendar year 1912, compared with 1911, increased from 1,168,700 to 1,653,000 tons, or approximately 41 per cent.

10. The chief industry in these islands is the production of sugar. The following table shows the increase in the sugar production of the Hawaiian Territory:

	Tons.
1875	4,000
1885	85,000
1895	227,000
1905	426,000
1912	595,000

11. The resources of this Territory are far from being fully developed, and the increase in commerce may be expected to continue. This increase will probably be accelerated after the Panama Canal is opened. It is likely, therefore, that in a very short time the capacity of the harbor will be insufficient to meet the demands upon it. The harbor can not be enlarged toward the east. Increased harbor facilities can only be provided by improving a portion of Kalihi Harbor. The railroad yards, factories, oil tanks, etc., are already being advanced in this direction.

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12. Kalihi Harbor is a large expanse of shallow water to the west of Honolulu Harbor and separated therefrom by "Sand Island" and the flats through which the strip marked "Reserved Channel" runs. At the Kalihi end of the "Reserved Channel" is a basin about the size of Honolulu Harbor, which contains the deepest water in Kalihi Harbor outside of Kalihi Channel. This is known as "Kapalama Basin." This basin has a present depth of 8 or 10 feet. It is said that the depth some years ago was about 25 or 30 feet, and that the depth has been decreased by deposits of silt. If this is true, the unit cost of dredging it should be small. The cost of dredging Kalihi Channel and a connection from it to Kapalama Basin or of dredging some other entrance to this basin will depend upon the nature of the material, which probably consists of coral in various stages of disintegration. The exact nature of the material to be dredged can only be determined by a survey.

13. It is believed that the desirability of affording increased harbor facilities to the city of Honolulu is sufficient to justify a thorough investigation into the feasibility and cost of obtaining them through the improvement of the eastern portion of Kalihi Harbor. It is therefore recommended that a survey be made of Kalihi Channel and the entire eastern part of Kalihi Harbor.

14. The work of improving this harbor can not be coordinated with the development and utilization of water power or other matters so as to reduce the cost of construction.

W. P. WOOTEN,
Major, Corps of Engineers.

[First indorsement.]

UNITED STATES ENGINEER OFFICE, PACIFIC DIVISION,
San Francisco, Cal., June 27, 1913.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

A survey seems desirable to determine the cost and advisability of developing Kalihi Channel and Kapalama Basin as an extension of Honolulu Harbor, and the recommendations of the district officer are therefore concurred in.

THOS. H. REES,
Lieut. Col., Corps of Engineers,
Division Engineer.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
July 30, 1913.

To the CHIEF OF ENGINEERS UNITED STATES ARMY.

For reasons stated herein, the board concurs with the district officer and the division engineer in recommending a survey in order to determine the extent and advisability of the improvement.

For the board:

W. M. BLACK,
Colonel, Corps, of Engineers,
Senior Member of the Board.

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LETTER OF KAPIOLANI ESTATE (LTD.).

HONOLULU, HAWAII, *April 28, 1913.*

SIR: This company takes pleasure in inclosing herewith a copy of the report of the borings it had done on the tide lands at Kalihi by Capt. A. A. Rosehill in the latter part of 1901. We have long looked forward to the day when a channel would be opened connecting the Honolulu and Kalihi Harbors. and trust that Congress in its wise judgment will see fit to appropriate the necessary funds and complete the work. Any old maps you may need in your work of surveying we can lend you upon intimation.

Yours, truly,

KAPIOLANI ESTATE (LTD.),
By JOHN F. COLBURN,
Its Treasurer.

Maj. W. P. WOOTEN,
Corps of Engineers.

LETTER OF HONOLULU CHAMBER OF COMMERCE.

HONOLULU, HAWAII, *May 16, 1913.*

SIR: Your circular letter of April 2 was brought to the attention of the board of trustees of the Honolulu Chamber of Commerce [at a meeting] held this afternoon and upon motion duly made and unanimously carried the inclosed resolution was adopted, and I was directed to forward a copy of the same to you.

Very truly, yours,

H. P. Wood, *Secretary.*

Maj. W. P. WOOTEN,
Corps of Engineers.

RESOLUTION OF HONOLULU CHAMBER OF COMMERCE.

Whereas it is proposed by the United States Government engineers to make a preliminary examination and survey of a channel connecting Honolulu and Kalihi Harbors, and

Whereas a request has been made that the business interests express their ideas on the project, and

Whereas the rapid growth of the business of the port of Honolulu is now taxing the full capacity of the harbor and its facilities, and

Whereas the opening of the Panama Canal demands that every effort be made to increase the area of navigable water and wharfage facilities, be it

Resolved, That the Chamber of Commerce of Honolulu most heartily indorse and urge the proposed examination and survey of the Kalihi Channel, recommending that the channel be the full 600 feet in width, and to a depth of 35 feet to correspond with the present harbor; and be it

Further resolved, That the president of this body reply to the letter from Maj. Wooten expressing the views herein expressed, inclosing a copy of this resolution.

I hereby certify that the foregoing is a true and correct copy of a resolution passed unanimously this day at a special meeting of the board of trustees of the Honolulu Chamber of Commerce.

[SEAL.] H. P. WOOD, *Secretary.*

MAY 16, 1913.

LETTER OF HONOLULU MERCHANTS' ASSOCIATION.

HONOLULU, HAWAII, *May 16, 1913.*

SIR: Referring to your circular letter addressed to those who might be interested in the transportation facilities of the port of Honolulu, the Merchants' Association of Honolulu has placed itself on record as heartily favoring the proposed channel opening between the present Honolulu Harbor and the adjacent basin known as Kalihi Harbor.

We believe that the time has arrived when it becomes absolutely necessary to increase the harbor facilities of the port of Honolulu by the development of wharves and shipping facilities on the west side of Honolulu.

We have the honor to herewith transmit a copy of resolution which was passed at the regular meeting of the association members, held on May 15, 1913. We wish also to offer for your consideration certain statistics which show the necessity of some action

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being taken along the proposed lines, and we trust that the matter will have your kind and careful consideration.

Independent of the commercial aspect of the situation, we would urge that the proposed channel is almost a necessity from a sanitation standpoint as the proposed channel would prove a means of cleansing the now conjested Honolulu Harbor, as well as make practical the segregation of those who might be required to be placed in quarantine, on what is known as Quarantine Island.

Assuring you of the hearty cooperation of the Merchants' Association in the work which you are undertaking in this Territory,

Respectfully, yours,

HONOLULU MERCHANTS' ASSOCIATION,
O. C. SWAIN, *President.*
OTTO A. BIERBACH, *Secretary.*

Maj. W. P. WOOTEN, *Corps of Engineers.*

RESOLUTION UNANIMOUSLY PASSED AT THE MEETING OF THE MERCHANTS' ASSOCIATION, MAY 15, 1913.

Whereas the commercial bodies of Honolulu have been notified of a proposed preliminary examination of Kalihi Harbor and Channel by the United States engineers, with a further request for suggestions bearing on this proposed improvement, and

Whereas the rapid growth of the shipping trade of the Pacific with the increased volume to follow the opening of the Panama-Interoceanic Canal, demands that steps be taken to increase the now inadequate space offered by the harbor of Honolulu, be it therefore

Resolved, That the Merchants' Association of Honolulu heartily indorse the proposed examination and survey of Kalihi Channel and earnestly recommend that a channel not less than 600 feet in width be opened between Honolulu Harbor and Kalihi Harbor, and that the latter basin be deepened sufficient to accommodate the largest trans-Pacific steamers, and be it further

Resolved, That a copy of these preambles and resolutions together with the prepared table of statistics, showing the growth of trade in Honolulu Harbor, be furnished Maj. W. P. Wooten, United States Army Engineer Corps, United States Army, Honolulu.

REASONS WHY HONOLULU HARBOR SHOULD BE ENLARGED BY THE OPENING OF A CHANNEL BETWEEN HONOLULU HARBOR AND KALIHI BASIN.

First. The Commerce of the Territory of Hawaii has steadily increased and is rapidly growing.

Second. The commerce and development of Honolulu and its vicinity has and is rapidly increasing, and future increased demands are to be made on the port of Honolulu in the very near future through the opening of the Panama Canal.

Third. The port of Honolulu has already reached its limit for the proper dispatch of vessels.

Fourth. The only apparent room for the further development of facilities is on the west side of Honolulu, in the Kalihi Basin.

The following facts and figures, together with a map,[1] are submitted herewith in support of the foregoing claims and the request for an appropriation to develop the Kalihi Basin:

Exports and imports of the Territory of Hawaii to and from foreign countries and the mainland of the United States show an increase from 1903 to 1912 of 105 per cent in the imports and 111 per cent in the exports and 108 per cent in the total commerce.

Growth of commerce of the Territory of Hawaii.

Fiscal year ending June 30—	Imports.	Exports.	Total commerce.
1903	$13,982,485	$26,275,483	$40,257,923
1904	15,784,691	25,204,875	40,989,566
1905	14,718,483	36,174,526	50,893,009
1906	15,693,874	26,994,824	42,634,698
1907	18,662,434	29,303,695	47,966,129
1908	19,757,270	42,241,921	61,999,191
1909	22,241,041	42,281,777	64,522,813

[1] Not printed.

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DEVELOPMENT OF HAWAIIAN COMMERCE (MORE PARTICULARLY THAT OF HONOLULU

From 1903 to 1912 imports have increased from $13,982,485 to $28,694,323, an increa of $14,711,838—equal to 105 per cent.

Hawaiian exports.—From 1903 to 1912 exports have increased from $26,275,483 $55,449,438, an increase of $29,173,955—equal to 111 per cent.

Total Hawaiian external commerce.—From 1903 to 1912 the total external commer of Hawaii increased from $40,257,923 to $84,143,760, an increase of $43,885,837—equ to 108 per cent.

Honolulu imports.—From 1904 to 1912 the imports at Honolulu, not including inte island business, increased from $11,746,811 to $28,108,889, an increase of $16,362,077 equal to 139 per cent.

Honolulu exports.—From 1904 to 1912 the exports at Honolulu, not including inte island business, increased from $15,058,433 to $27,807,486, an increase of $12,749,053 equal to 84 per cent.

Total Honolulu external commerce other than inter island.—From 1904 to 1912 the tot external commerce of Honolulu increased from $26,805,245 to $55,916,375, an increa of $29,111,130—equal to 108 per cent.

Deep-sea tonnage entering Honolulu.—From 1903 to 1912 the gross tonnage of dee sea shipping in Honolulu Harbor increased from 900,493 tons to 1,311,676 tons, an in crease of 411,183 tons—equal to 45½ per cent.

Fiscal year ending June 30—	Imports.	Exports.	Total commerce
1910	$26,152,435	$47,029,631	$73,182,06
1911	28,065,626	42,666,197	70,731,82
1912	28,694,322	55,449,438	84,143,76

Exports and imports, Honolulu, to and from foreign countries and the mainland o the United States, show an increase from 1904 to 1912 of 139 per cent in imports, 8 per cent in exports, and 108 per cent in the total commerce.

Growth of commerce of the port of Honolulu, island of Oahu.

Calendar year.	Imports.[1]	Exports.	Total commerce.
1904	$11,746,812	$15,058,433	$26,805,24
1912	28,108,889	27,807,486	55,916,37

[1] Not including inter-island business.

Deep-water shipping entering Honolulu shows an increase in tonnage from 1903 to 1912 of 411,183 tons—equal to 45½ per cent.

Growth of deep-sea shipping business at Honolulu.

Fiscal year ending June 30—	Number of ships.	Gross tonnage.
1903	462	900,49
1912	370	1,311,67

Growth of the sugar business on the island of Oahu shows an increase from 1903 to 1912 of 18,646 tons—15 per cent.

Fiscal year ending June 30—	Tons.
1903	121,056
1912	139,712

While the actual number of vessels entering Honolulu was less in 1912 than in 1903, owing to the substitution of bigger ships, the necessity for supplying accommodations

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for the larger vessels was more difficult than had there been a greater number of smaller vessels, because of the larger cargoes that had to be accommodated upon arrival.

Growth of sugar industry near Honolulu.—Sugar grown on the Island of Oahu and shipped from the port of Honolulu has increased from 121,066 tons in 1903 to 139,712 tons in 1912, equal to 15 per cent. It is to be noted that while the total commerce of the port of Honolulu has increased in 10 years 108 per cent, sugar has only increased 15 per cent, thereby showing that the main development has been other than increase in sugar commerce—a growth along other lines. In view of this fact, there is every reason to believe that the commerce of the port will continue to grow as rapidly in the next 10 years as it has in the past, and this conclusion alone justifies the request for the development of further harbor facilities.

Pineapples.—The pineapple industry scarcely existed in Hawaii prior to 1903. In that year, the export of canned fruit amounted to 8,000 cases. The quality of the canned pineapple produced in Hawaii is so superior to that produced elsewhere that the growth of the demand has been phenomenal.

For the year ending June 30, 1912, the value of canned pineapples exported from Hawaii amounted to $2,567,564. This industry is rapidly increasing, as thousands of acres on the Island of Oahu alone of land which has heretofore been used only for ranch purposes are now being plowed in preparation for the first planting of pineapples.

Growth of population.—The census of 1900 showed the population of the Territory to be 154,001, increased by 1910 to 191,909, an increase of 37,908, equal to 24 per cent.

The population on the Island of Oahu in 1900 was 58,504 and in 1910 was 81,993, an increase of 23,489, equal to 40 per cent.

Opening of Panama Canal.—It is impossible to say of how great importance to the commerce of Hawaii will be the opening of the Panama Canal. Arguments and statistics, however, are unnecessary to show that from its geographical position, Hawaii, and more especially the port of Honolulu, is destined to be the port of call for a very large amount of additional shipping. As the hub of the Pacific, Hawaii will be called upon as a supply and repair station to a very large extent, in addition to the regular commerce that will naturally be developed.

Honolulu Harbor development.—The Territorial board of harbor commissioners has done good work in planning for improved facilities in Honolulu Harbor, but when the contemplated improvements have been completed no further relief can be obtained, due to the present confines of the harbor.

Room for expansion.—The most practicable opportunity for expansion is in the dredging of the 600-foot channel in to the Kapalama and Kalihi Basin, which would enable the doubling of the wharfage facilities of the port of Honolulu.

We therefore urge that action be taken at the earliest possible date to further this project.

LETTER OF HAWAIIAN TRUST CO. (LTD.).

HONOLULU, HAWAII, *May 16, 1913.*

SIR: Referring to your circular letter of April 2, 1913, re preliminary examination of Kalihi Harbor and Channel, a copy of this circular letter eventually came to the office of the Hawaiian Trust Co. some time ago, addressed to the Dowsett Co. (Ltd.).

In view of the fact that the Hawaiian Trust Co. is no longer the business manager of the Dowsett Co., said letter was promptly forwarded to the Dowsett Co.

Having heard just a few days ago of the contents of such circular letter, we immediately sent to your office to secure a copy and, while we have no specific suggestions to make at this time, we desire to inform you that we are most heartily in favor of this preliminary examination of the Kalihi Harbor and Channel, and believe it a matter of vital interest to Honolulu.

It has long been our opinion that the present 600-foot channel reservation should be dredged, and Kalihi Harbor thereby be connected with the Honolulu Harbor and both harbors made available for the increased shipping which we feel confident is going to come here.

We beg to thank you for calling our attention to this matter, and if we can assist in any way in carrying on the proposed preliminary examination, we trust you will not hesitate to call upon us.

Yours, very truly,

ESTATE OF JOHN ENA.

By its trustees: THE HAWAIIAN TRUST CO. (LTD.),
By J. R. GALT, *Its Treasurer.*

Maj. W. P. WOOTEN,
Corps of Engineers.

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LETTER OF TERRITORIAL BOARD OF HEALTH.

HONOLULU, HAWAII, *May 19, 1913.*

SIR: A member of the Merchants' Association has called my attention to the matter of opening up of Kalihi Harbor and Channel and the benefits which would be derived from it. He informed me that you were receiving suggestions from the commercial bodies and that he thought you would be willing for some suggestions from a health standpoint.

The opening up of a channel between the present Honolulu Harbor and the Kalihi Harbor has been agitated a number of times by the board of health, particularly during the time when Mr. W. O. Smith was president of the board. Some of the advantages in the opening of this channel from the health side would be the creation of a current which would tend to better carry away the refuse from ships in the harbor and the wash from Nuuanu stream. It would also provide a large amount of material which could be utilized in the filling up of the present insanitary lands in Honolulu. Another advantage would be that shipping would be farther away from the business and resident parts of the city, thereby lessening the danger of vessels arriving from plague or cholera infected ports.

It would also better isolate the present Federal quarantine station at Mauliola.

Respectfully submitted.

J. S. B. PRATT, M. D.,
President Territorial Board of Health.

Maj. W. P. WOOTEN,
Corps of Engineers.

LETTER OF BOARD OF HARBOR COMMISSIONERS.

TERRITORY OF HAWAII,
DEPARTMENT OF PUBLIC WORKS,
Honolulu, May 21, 1913.

SIR: * * * We also wish to state that the board of harbor commissioners heartily indorses the surveying of a 600-foot channel and considers it to the interest of the Territory and the public at large that immediate action be taken along the lines indicated.

Yours respectfully,

J. W. CALDWELL,
Chairman Board of Harbor Commissioners.

Maj. W. P. WOOTEN,
Corps of Engineers.

LETTER OF OAHU RAILWAY & LAND CO.

HONOLULU, HAWAII, *May 26, 1913.*

SIR: In reply to your circular letter asking for suggestions in regard to the proposed survey of Kalihi Channel, we have to say that the matter of the enlarging of Honolulu Harbor by cutting a channel through from the west side of Honolulu Harbor to the Kalihi Harbor has been the subject of discussion by the management of this company for a good many years.

The channel reservation as set out on the harbor maps shows a strip 600 feet in width.

When the settlement of the dispute of title between Dowsett and Sumner and the United States Government was reached, whereby the cloud on the tidelands and harbor frontage property to the west and south of Honolulu Harbor, and including Quarantine Island and the sea and reef portion of the land in dispute, was quitclaimed to the United States Government, and the harbor tideland and the high land back of Oahu prison was quitclaimed to the Dowsett and Sumner holders, the Government and the Dowsett and Sumner interests each contributed 300 feet of the proposed channel, and it was agreed that this strip should be kept as an open waterway.

It has been anticipated for 15 years that, sooner or later, the harbor would be opened up toward Kalihi. The popular idea seems to be that the only benefit to Honolulu Harbor would be to carry this proposed channel through to the Kalihi Channel, but by way of suggestion, we would respectfully call your attention to the fact that halfway between Honolulu and Kalihi Harbors there is a body of water known as Palama Basin

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which contains an area approximately equal to the area of Honolulu Harbor. This basin, only a few years ago, had a depth of 26 to 30 feet, but, due to the reclaiming of swamp lands above the Palama Basin, there has been a very rapid silting in, until the space now has approximately an average depth of 9 feet.

We are satisfied, however, that the material down to a depth of 40 feet or more is nothing but loose silt, which could be dredged at very small cost. In our judgment, a channel cut through as proposed would at once bring this basin within the reach of Honolulu Harbor, and, as above stated, at small cost the basin could be made navigable for any ships entering Honolulu Harbor.

I am taking the liberty of sending herewith a blue print[1] showing the soundings which we have secured from the Hawaiian Dredging Co., showing the depth of water in Palama Basin at the present time.

The great advantage of extending the harbor to include the Palama Basin is that the whole wharfage area developed could be readily connected with railroad tracks, and at the same time would be very central to the canneries, limekilns, oil tanks, and sugar warehouses—in other words, would conveniently serve the largest commercial and shipping interests of Honolulu.

Yours, truly,

OAHU RAILWAY & LAND CO.,
By its treasurer, W. F. DILLINGHAM.

Maj. W. P. WOOTEN,
Corps of Engineers.

SURVEY OF KALIHI HARBOR AND CHANNEL, HAWAII.

UNITED STATES ENGINEER OFFICE,
Honolulu, Hawaii, January 5, 1914.

From the District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Survey of Kalihi Harbor and Channel, Hawaii.

1. In compliance with letter from the Chief of Engineers dated August 13, 1913, a survey has been made of the entire eastern portion of Kalihi Harbor, including Kalihi Channel. In order to show fully the relation of the harbor to the city of Honolulu and its present harbor, the map of the survey, submitted herewith,[1] has been made to include the present harbor of Honolulu which has been platted from data already at hand.

2. As stated in the preliminary report, any improvement undertaken at this locality should be carried out for the purpose of providing increased harbor facilities for the city of Honolulu and not of developing a separate and independent port.

3. A description of Honolulu Harbor and a statement of its commercial statistics were given in the preliminary report. It was also stated therein that the capacity of the harbor would soon be exhausted and that the only practicable method of increasing the capacity of the port is by opening up new harbor facilities in Kalihi Harbor.

4. The first method of accomplishing this result which suggests itself is to dredge that portion of Kalihi Harbor known as Kapalama Basin and to connect it with the sea by Kalihi Channel, through the dredged cut O, R, S, G. The material to be dredged from Kapalama Basin is soft and easily handled. That to be dredged from Kalihi Channel and the cut O, R, S, G, is more varied in character and is composed in part of coral of considerable hardness. The unit cost of dredging the channel and cut will therefore be considerably greater

[1]Not printed.

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than that of dredging the basin. It is estimated that this project would cost as follows:

Dredging:	
Kapalama Basin, 3,750,000 cubic yards, at 20 cents	$750,000
Channel O, R, S, G, 2,200,000 cubic yards, at 35 cents	770,000
Kalihi Channel, 1,700,000 cubic yards, at 30 cents	510,000
Superintendence and contingencies	203,000
Total	2,233,000

Annual cost of maintenance should not be more than $20,000.

5. Although this project is feasible and would perhaps be worthy of adoption if it were the only practicable one, there are several objections to it. In the first place it provides two separate harbors for Honolulu with no connecting waterway between them, other than the open sea. Needless to say, the inconvenience of such an arrangement should be avoided if possible. In the second place, it provides one more harbor entrance which would have to be defended. The cost of batteries and submarine mining equipment required for this defense is not estimated here, but it would seem proper to consider it as a large item properly chargeable against the improvement, although to be provided for in other appropriations. The result of this would be to make the project a disproportionately expensive one. It is therefore not recommended for approval.

6. Any plan for the improvement of Kalihi Harbor which involves the dredging of Kalihi Channel will be subject to the same objections. It is, however, entirely possible to separate the two and provide for the improvement of Kalihi Harbor, leaving Kalihi Channel in its present unimproved condition. Of course, in this case it will be necessary to provide another entrance to the harbor which will be free from the objections found to Kalihi Channel.

7. The most feasible and desirable plan for the improvement of Kalihi Harbor would seem to be one which involves the dredging of that part of the harbor known as Kapalama Basin and providing an entrance to the dredged area from Honolulu Harbor rather than directly from the sea. In this way, Kalihi Harbor could be entered only by going through Honolulu Harbor and the two harbors together would have all the advantages offered by a single harbor. Should it be deemed desirable to double Honolulu's capacity to handle shipping, this result can be secured by dredging Kalihi Harbor within the lines B, D, E, G, H, and providing an entrance thereto by dredging the "Reserved Channel" strip. The tidal range is about 2 feet. There would thus be provided a channel 600 feet wide and 3,400 feet long and an inner basin of about 1,800 by 2,400 feet in size. The whole north side of the "Reserved Channel" would be available for either a continuous bulkhead wharf or for slips, so that the total wharf frontage would be 9,150 feet.

8. It is not believed that the commercial development of the port will be sufficient for some years to require the improvement of Kalihi Harbor to the extent just indicated. On the other hand, it is quite probable that it will at some future time become necessary to improve the harbor to that extent and perhaps to an even greater extent. Therefore, no project should be undertaken at this time which does not lend itself to the eventual enlargement of the harbor to the limits indicated in the preceding paragraph. It is accordingly recommended that the combined pierhead and bulkhead lines AB, BC, FG, and HI,

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e bulkhead lines CD, DE, and EF, and the pierhead line CF be lopted for the extension of the harbor, the line from G to H being nitted for the present.

9. Borings have been taken to determine the nature of the material be dredged. The Reserved Channel consists principally of coral an advanced stage of disintegration, with numerous pockets of nd. The material in Kapalama Basin is apparently a fill, consisting sand, mud, and small pieces of coral. This fill is said to have re-lted from certain extensive reclamation projects which were under-ken in this vicinity some years ago.

10. From the information furnished by this survey as to the nature d quantity of materials to be removed it is estimated that the proj-t outlined in paragraph 7 would cost as follows:

edging:

Kapalama Basin, 3,750,000 cubic yards, at 20 cents	$750,000
Reserved Channel, 3,400,000 cubic yards, at 30 cents	1,020,000
Superintendence and contingencies	180,000
Total	1,950,000

Annual cost of maintenance should be small and should not exceed 2,500. It is believed, however, that the immediate needs of Hono-lu, as well as those which may reasonably be expected to develop thin the next few years, may be met by a more modest project than e one for which this estimate is made.

11. It is recommended that a basin of only about 1,000 feet square dredged in Kalihi Harbor and that the entrance to this basin rough the "Reserved Channel" be dredged to a width of 400 feet ly, the whole dredged area to be that bounded by the lines A, B, M, N, J. This area should be dredged to a depth of 35 feet below ean lower low water, this being the depth provided in Honolulu arbor at present. The cost of this project is estimated as follows:

edging:

Kapalama basin, 800,000 cubic yards, at 20 cents	$160,000
Reserved Channel, 2,200,000 cubic yards, at 30 cents	660,000
Superintendence and contingencies	80,000
Total	900,000

The annual maintenance of this project should not exceed $8,000.

12. In order that the public may derive the full benefit of this provement it should own and control the entire new water front be opened. Any appropriation made by Congress for beginning is work should therefore be made contingent upon the securing, the Territory of Hawaii, of title to a strip of land at least 200 feet ide immediately back of the proposed new harbor lines A, B, D, E, thus insuring public control of all wharves to be erected along this e.

13. The initial appropriation should not be less than $200,000, ith the "continuing contract" provision for the expenditure of 00,000 or more, and should provide for the purchase by the United ates of its own dredging plant, if satisfactory bids should not be ceived for dredging. Appropriations should be made thereafter the rate of $200,000 per annum until the entire amount has been propriated.

W. P. WOOTEN,
Major, Corps of Engineers.

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[First indorsement.

UNITED STATES ENGINEER OFFICE,
Honolulu, Hawaii, January 16, 1914.

To the CHIEF OF ENGINEERS:

1. Forwarded, concurring in the views and recommendations of the district officer.

2. It may further be pointed out that an entrance channel to Kalihi Harbor from Honolulu Harbor will develop usable harbor frontage on both sides of this connecting channel, and will reclaim lands south of the channel that belong to the United States. All of the dredging will therefore serve three purposes, namely, the extension of the harbor area, the development of available wharf frontage, and the reclamation of adjacent land.

3. The deepening of Kalihi Channel as a separate entrance and the extension of this channel to Kapalama Basin would serve the single purpose of an entrance channel without developing any additional wharf frontage or reclaiming any usable land.

4. A second entrance to the extended harbor is neither necessary nor desirable.

THOS. H. REES,
Lieut. Col., Corps of Engineers,
Division Engineer, Pacific Division.

[For reports of the Board of Engineers for Rivers and Harbors on survey, see page 3.]

SUPPLEMENTAL REPORT ON KALIHI HARBOR AND CHANNEL, HAWAII.

UNITED STATES ENGINEER OFFICE,
Honolulu, Hawaii, November 30, 1914.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
(Through the Division Engineer.)
Subject: Modified project Kalihi Harbor.

1. In accordance with indorsement dated October 2, 1914, a modified project for improving Kalihi Harbor and channel is hereby submitted, embodying the suggestions made in letter of the Board of Engineers for Rivers and Harbors.

2. Previous to the adoption of the present project for Honolulu Harbor this harbor and Kalihi Harbor were separated only by low coral reefs and connected at high tides. Rowboats passed from one harbor to the other through what was termed "Kalihi Channel," but now known as the "Reserved Channel." This channel has silted to an average grade of 1.7 feet above mean lower low tide, and consequently is covered with water at high tide only.

3. Dredgings from Honolulu Harbor were deposited on the coral reefs between the two harbors, forming the tracts of land now known as Sand Island and Quarantine Island, containing approximately 70 acres and 37 acres, respectively.

4. At the time of the adoption of the project for Honolulu Harbor the present amount and character of commerce was not anticipated. The harbor has not sufficient width for the proper maneuvering of

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e large boats now using this harbor, and the lack of wharf frontage already felt.

5. It is reasonable to expect a continued growth of the commerce. ractically all of the wharf frontage is occupied, except on the Sand land side, which up to the present time has not been accessible to ıe deep water of the harbor. Sand Island is owned by the United ;ates, and while the approved project for Honolulu Harbor provides r dredging to the harbor lines, wharves can not be built and used ıtil the approved project is completed. Future dredging here is ntingent upon the removal of the quarantine wharf, which extends)0 feet beyond the harbor lines. The deep water to the north of ıis wharf was secured during the present fiscal year.

6. Moreover, the use of this space for wharves would still more arrow the harbor and restrict the maneuvering of the larger boats,) that recourse must be had by the improvement of Kalihi Harbor nd channel.

7. The project for Kalihi Harbor and channel as submitted by this ffice on January 5, 1914, recommended the dredging of Kapalama ;asin, included within the lines B, D, E, G, and H, and a connection ;ith Honolulu Harbor by the "Reserved Channel" 600 feet in width.

8. As suggested by the Board of Engineers for Rivers and Harbors, he modification of this project for dredging the "Reserved Channel" o a width of 1,000 feet instead of 600 feet would eliminate the ıecessity for the turning basin at the end of the channel and would ermit the utilization of the first section constructed to immediately elieve the present congested condition of Honolulu Harbor by fur- ıishing additional wharf space and by increasing the area of the ıarbor.

PROJECT NO. 1.

9. Change the present approved combined pierhead-bulkhead line 00 feet south from I–H to g–h so as to increase the "Reserved Channel" from 600 to 1,000 feet in width.

Provide a channel 800 feet wide to be dredged by the United States ncluded within the lines b–d, d–K–e, and e–f, leaving 100 feet along ach bulkhead line to be handled by adjacent owners.

Estimated cost.

,650,000 cubic yards dredging, at 30 cents	$1,395,000
Superintendence and contingencies	140,000
Total	1,535,000

The annual maintenance of this project should not exceed $12,000.

PROJECT NO. 2.

10. This project is similar to project No. 1, but provides a wider and more convenient entrance to the "Reserved Channel" and gives a greater length of wharf frontage.

This project is outlined by the letters A, P, K, h, k, l, and m. Leaving 100 feet along each bulkhead line to be removed by the owners of adjacent land, the area to be dredged by the United States would be included by the letters b, d, K, e, i, j, and m.

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This would provide 3,700 feet of wharf frontage on the north side from A to P, 3,060 feet on the south side from h to k, and 2,120 feet from k to l.

Estimated cost.

5,390,000 cubic yards of dredging, at 30 cents	$1,617,000
Superintendence and contingencies	162,000
Total	1,779,000

The annual maintenance of this project should not exceed $13,000.

11. If either project is adopted, a section 1,000 feet in length should be immediately executed but the remainder should not be undertaken until the commerce has reached a stage to justify further expenditure.

12. Estimate of cost of 1,000 feet of project No. 1 as outlined by letters A, a, k, and g; the dredging to be done by the United States as outlined by the letters b, c, i, and f.

1,330,00 cubic yards dredging, at 30 cents	$399,000
Superintendence and contingencies	40,000
Total	439,000

The annual maintenance for this section should not exceed $6,000.

13. Estimated cost of 1,000 feet of project No. 2, as outlined by the letters A, a, k, l, and m; the dredging to be done by the United States as outlined by the letters b, c, i, j, and m.

2,070,000 cubic yards dredging, at 30 cents	$621,000
Superintendence and contingencies	62,000
Total	683,000

The annual maintenance of this section should not exceed $8,000.

14. Project No. 2 is recommended for adoption for the reason that it furnishes a greater length of wharf frontage and greatly increases the harbor area at only a slight increase in cost over project No. 1. It further lends itself to the enlargement of Honolulu Harbor and entrance by the future removal of the area l, m, n, which will probably be necessary in the near future as a part of the improvement of Honolulu Harbor.

15. The commerce, both local and foreign, has developed to even a greater extent than estimated in the original report, and the necessity for a harbor of refuge for commercial vessels of our own or of other nations has been shown during the present war. All available wharves have been occupied and at times vessels seeking refuge have been forced to lie out in the outer harbor.

16. This modified project has been discussed with the Territorial authorities and with the chamber of commerce and with the Inter-Island steamship interests who have given the plan their approval.

17. The Governor of the Territory has assured this office that if this project is adopted every endeavor will be made to acquire land by the Territory for wharfage purposes on the south side of the harbor and to construct a solid bulkhead wall along the entire Sand Island frontage. It is believed that land belonging to the Territory available and suitable for the needs of the Army and Navy can be exchanged for portions of the harbor frontage along Sand Island. This frontage then could be utilized by the United States for the quarantine station,

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immigration station, lighthouse department, and by the Territory for coaling plants and fuel stations that require no terminal facilities on the Honolulu side of the harbor.

18. It is not believed that the commerce will justify the expenditure for this entire project for some years to come, but it is believed, however, that the present and prospective commerce justifies the expenditure required for the execution of the first 1,000 feet of project No. 2. It is therefore recommended that while project No. 2 be adopted as the approved project for this locality funds be appropriated only for the construction of the first 1,000 feet.

19. The initial appropriation should not be less than $200,000, with a "continuing contract" provision for the expenditure of $200,000 more, and should provide for the purchase by the United States of its own dredging plant in case reasonable bids are not secured for doing the work by contract. Appropriation should be made thereafter at the rate of $200,000 per annum until the entire amount has been appropriated.

20. There are no questions of water-power development involved; the docks and terminals are shown on the accompanying map and are described at length in the report of preliminary examination dated June 5, 1913.

21. There appears to be no further cooperation possible with a view to reducing the cost of the improvement other than as stated above.

22. A map is being prepared to replace the blue prints now inclosed and will be forwarded in a few days.

CHAS. S. BROMWELL,
Lieut. Col., Corps of Engineers.

[First indorsement.]

OFFICE DIVISION ENGINEER, PACIFIC DIVISION,
San Francisco, Cal., December 8, 1914.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following modifications of the proposed plan are suggested:

(*a*) Prolong the harbor line running from "lighthouse" through m in a northwesterly direction to its intersection with the line k–g, thus cutting off the small salient at g, and leave for future consideration the further widening of the harbor to the line k, l, n.

(*b*) Prolong the harbor line now running across the northern end of the harbor, Matson Wharf–Sta. Tank, in a westerly direction to its intersection with the line A–a, thus cutting off the sharp salient at A.

2. The quarantine wharf, when moved, might be placed either at k or at n, where it would not interfere with the future widening of the harbor as proposed.

THOS. H. REES,
Lieut. Colonel, Corps of Engineers,
Division Engineer.

LETTER OF THE GOVERNOR OF HAWAII.

EXECUTIVE CHAMBER,
Honolulu, Hawaii, November 25, 1914.

SIR: I have the honor to hand you herewith the report of the harbor commissioners of the Territory of Hawaii, relative to the enlargement of Honolulu Harbor and its extension relatively 1,000 feet into the proposed Kalihi Channel. The plans here-

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with submitted meet with my approval. I wish to acknowledge the courtesy and interest of yourself and the Board of Engineers for Rivers and Harbors in the needs of Honolulu Harbor and Pacific commerce.

Very respectfully,

LUCIUS E. PINKHAM
Governor of Hawaii.

Lieut. Col. C. S. BROMWELL,
Corps of Engineers.

REPORT OF THE BOARD OF HARBOR COMMISSIONERS OF THE TERRITORY OF HAWAII.

HONOLULU, HAWAII, *November 24, 1914.*

SIR: We herewith hand you a plan and set of photographs showing the proposed Kalihi Channel extension and the congested condition of our wharves. We respectfully request that you confer with the department engineer officer, Lieut. Col. Bromwell, for the purpose of placing the facts before him and request that he should cooperate with us in presenting to the Board of Engineers for Rivers and Harbors at Washington, D. C., the imperative need of this immediate improvement.

In former days it was possible to moor a certain number of vessels in the stream when the wharves were congested, but even that accommodation is restricted now from the fact that there is no room in the harbor to safely maneuver our increased commerce. Lack of berthing facilities for the increasing number of large steamers continuously calling at this port proves conclusively the necessity of having additional harbor space and wharves.

All the available space at the wharves is being taxed to its utmost, and at the present time we are designing a reinforced concrete wharf, to be built at the foot of Fort Street, that will cost $200,000, and with its completion all the available and limited space for wharf purposes will be in use, and it will be absolutely impossible for us to provide any further wharf accommodations for immediate or even future use. We believe that the solution of the problem lies in the dredging of Kalihi Channel as per the plan submitted to you. With this improvement we would have additional wharf space and accommodation for our present commerce. As you are aware, we are now barely able to accommodate the regular vessels making this port, including trans-Pacific liners en route to the Orient, all of which are on schedule time and depend upon prompt dispatch to maintain their service.

This proposed extension of Kalihi Channel will necessitate the removal of quarantine wharf, and Lieut. Col. Bromwell informs me that this wharf is to be removed.

You will also notice from our plan that we recommend the removal of the present lighthouse to a point farther to the southward of its present location and with that area dredged it would afford more harbor space and eliminate all possibility of vessels touching the wall around Sand Island when backing out of their slips, as was the case of the steamship *Tenyo Maru* on July 12 of last year.

You will also note that our recommendation is for a channel 1,000 feet wide and 1,000 feet long, and with that portion of Sand Island dredged we would have a bulkhead wharf approximately 3,200 feet in length.

We would mentioned again that on August 30, 1914, the Chamber of Commerce of Honolulu made a report on the extension of Honolulu Harbor to the Kapalama Basin, and the governor prepared a map showing the maneuvering areas required by vessels. These data show in detail the growth of shipping in the harbor since 1905. Not only all the imports and exports have increased, but the interisland trade has also increased. This report shows that even port or deep-sea vessels in the harbor have increased from 333 in 1907 to 422 in 1914, and this in face of the present requirements for greater tonnage and larger boats. This report shows that the commerce curve for Honolulu is rapidly rising, and we have no reason to believe that from now on there will be any radical or violent change in this direction.

Condition since June 30, 1914.—Assuming that some change of commercial conditions should prevent further increase of trade in Honolulu and that the commerce curve remains at its present point, even so the harbor can scarcely handle the present traffic. Extra boats, or boats which arrive on the same day, are sometimes troubled to find available berths. We have 22 berths, of which only 10 are under the control of the board of harbor commissioners, or the Territory. In this day, when a large vessel must deliver or take on from 1,000 to 5,000 tons of freight in one day, it is necessary to have ample and commodious wharfage, and at present Honolulu Harbor does not contain sufficient accommodation for the present commerce.

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Vessels at R.R. Wharf.

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Showing congested condition of wharves.
Vacant wharf is for regular assigned vessels.

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There are two world factors which will have a decided effect on Honolulu. These are the opening of the Panama Canal and the hostilities in Europe. With the advent of commerce through the Panama Canal, Honolulu will offer a convenient place for water, coal, and general supplies. It is scarcely probable that of all the Panama vessels making the long journey of the Pacific there will not be at least a portion which will find it advantageous and convenient to make the port of Honolulu, either for necessary supplies, repairs, or as a port of call on a regular or irregular run. Even now we are informed that there are 12 vessels headed for Honolulu via the Panama Canal. But at present we are scarcely able to accommodate the regular traffic without the Panama trade. With the average increase of trade in Honolulu, as has been experienced for the past five years, we find ourselves in a position of being unable to care for the Panama trade or to even satisfactorily dispose of the expected normal increase.

The war in Europe must have some important effect on American commerce. The European war of 100 years ago created America's merchant marine. The present war may revive it, and in any case must certainly encourage American shipping. How much Honolulu will benefit from this is problematical, but it is inconceivable that her port tonnage would be decreased by such an event.

There are several vessels under the English flag of the Canadian-Australian line regularly scheduled for Honolulu, but owing to the hostilities these vessels have not made Honolulu a port of call, but upon the cessation of the war they will again be placed on their regular schedules.

Method of expansion.—The solution of a congested harbor is its expansion and improvement. The harbor board has under way large projects for improving their wharves and their facilities for handling freight. In the past two years they have planned many things and constructed and improved wharves and shipping facilities.

It is necessary now to look for further area in order to provide for a future that can not be avoided. In presenting to you our plan of the Kalihi Channel extension we consider—

First. That this is the only direction in which the harbor can be extended.

Second. That the channel should be widened at the harbor end as shown on the plans.

Third. That the channel should be 1,000 feet in width.

Fourth. That the construction of this work can readily be performed by units and that practically the full benefit of the completion of one unit can be appreciated and utilized now by the Honolulu commerce.

We consider it entirely feasible on the completion of the proposed work, as shown on the plans, to construct a bulkhead wharf on the long side where the present quarantine wharf now stands and this wharf be connected by a road to the city.

Very respectfully,

BOARD OF HARBOR COMMISSIONERS,
By its chairman, CHARLES R. FORBES.

Hon. LUCIUS E. PINKHAM,
Governor of Hawaii, Honolulu.

LETTER OF INTERISLAND STEAM NAVIGATION CO. (LTD.).

HONOLULU, HAWAII, *November 27, 1914.*

SIR: In reference to the proposed extension or enlargement of Honolulu Harbor toward Kapalama Basin as shown on the map which has recently been prepared by Mr. Charles R. Forbes, chairman of the board of harbor commissioners, and which covers the project as recommended by him and approved by said board, we beg to take this opportunity of saying that the project meets with our unqualified approval and in our opinion the enlargement of Honolulu Harbor on the lines laid down by Mr. Forbes is a real necessity and should be undertaken by the Federal authorities at the earliest possible moment.

You are, doubtless, aware that our company owns and operates 16 steamers between Honolulu and other island ports and owing to the very limited wharfage room in Honolulu Harbor, it is difficult sometimes to find sufficient berths for our steamers.

We are large dealers in coal, and in addition to coaling most of the regular scheduled mail steamers calling at this port, we are now also supplying bunker coal to a number of tramp steamers calling here on their way to and from the Orient via the Panama Canal. This business is constantly increasing, and it seems probable that there will be in the future a considerable increase in the number of steamships calling at Honolulu for coal and other supplies.

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The small area of Honolulu Harbor is barely sufficient at present to take c
shipping entering this port and it, therefore, seems to us that every effort s
made to add to the area of the harbor on the lines laid down by the chairm
board of harbor commissioners.

Very truly, yours,

INTERISLAND STEAM NAVIGATION CO.
By JAS. L. MCLEAN, *Vice President.*

Lieut. Col. C. S. BROMWELL,
Corps of Engineers.

LETTER OF CHAMBER OF COMMERCE OF HONOLULU.

HONOLULU, HAWAII, *November 2*

SIR: At a meeting of the maritime affairs committee of the Chamber of C
of Honolulu, held on the 25th instant, the matter of the proposed improve
extension of Honolulu Harbor was considered. The committee had before
made by the board of harbor commissioners of this Territory, whereby it is
to extend the harbor in accordance with a map [1] which I beg to hand you her

The proposal was discussed and carefully considered and it is the unanim
of the committee that the necessary steps be taken which will commend
gested improvement for the favorable consideration of the Board of Engi
Rivers and Harbors.

With kindest regards, I am,

Very truly, yours,

RAYMOND C. BROWN, *Se*

Lieut. Col. C. S. BROMWELL,
Corps of Engineers.

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[1] Not printed.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 393.

BRUNSWICK HARBOR, GA.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORTS ON PRELIMINARY EXAMINATION AND SURVEY OF BRUNSWICK HARBOR, GA., WITH A VIEW TO SECURING INCREASED DEPTH OF CHANNEL.

DECEMBER 14, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustrations.

WAR DEPARTMENT,
Washington, December 13, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated August 13, 1915, together with copies of reports from Col. Dan C. Kingman (now Chief of Engineers, United States Army) and Col. W. C. Langfitt, Corps of Engineers, dated July 7, 1913, and March 8, 1915, with maps, on preliminary examination and survey, respectively, of Brunswick Harbor, Ga., made in compliance with the provisions of the river and harbor act approved March 4, 1913.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, August 13, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination and survey of Brunswick Harbor, Ga.

1. There are submitted herewith for transmission to Congress report dated July 7, 1913, by Col. Dan C. Kingman, Corps of Engi-

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neers (now Chief of Engineers, United States Army), and report dated March 8, 1915, with maps, by Col. W. C. Langfitt, Corps of Engineers, on preliminary examination and survey, respectively, of Brunswick Harbor, Ga., with a view to securing increased depth of channel, authorized by the river and harbor act approved March 4, 1913.

2. The existing project for improvement of Brunswick Harbor, adopted by the act of March 2, 1907, provides for securing, mainly by dredging, channels 30 feet deep at mean high water, 400 feet wide across the outer bar, 300 feet at Brunswick Point Shoal, 300 feet in Turtle River up to the Southern Railway terminal, 350 feet in East River, and 150 feet wide in Academy Creek, including also the extension of the existing training wall in East River and the construction of two spur dikes. As the mean tidal range is about 6.6 feet on the bar, 7 feet at Brunswick Point, and 7 feet at the city of Brunswick, the authorized channel depth is equivalent to a depth of about 23 feet at mean low water, which is not sufficient for the accommodation of the larger vessels visiting this port. Moreover, the district officer points out that the vessels are generally more heavily laden when outbound than inbound, and as high tide occurs about one hour earlier at the outer bar than at Brunswick, which is 14 miles distant, they are not able to take full advantage of the tidal range. The commerce of this harbor has shown a steady increase since its improvement was undertaken by the United States, and in 1913 was reported as amounting to 1,009,007 tons, having a value of $58,246,425. Considering all the circumstances set forth in the reports on preliminary examination and survey, the district officer is of opinion that this harbor is worthy of further improvement to the extent of providing channels as follows, all depths being referred to mean low water:

(*a*) Bar Channel, 500 feet wide and 27 feet deep.
(*b*) Brunswick Point Channel, 400 feet wide and 27 feet deep.
(*c*) East River Channel, 350 feet wide and 24 feet deep.
(*d*) Turtle River Channel, 350 feet wide and 24 feet deep.
(*e*) Academy Creek Channel, 150 feet wide and 24 feet deep.
(*f*) Cut from Academy Creek to Turtle River if later decided advisable.

The estimated cost of this work is $561,000 for first construction and $50,000 per annum thereafter for maintenance, both estimates being based on the assumption that Government dredges will be available for the work.

3. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to the board's report herewith, dated July 13, 1915. The board concurs in general with the recommendations of the district officer, but it believes that a depth of 24 feet in the Brunswick Point Channel will be sufficient for present and immediately prospective needs. As thus modified the estimated cost of the project is $510,000.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer and the Board of Engineers for Rivers and Harbors in regard to the need for increased navigation facilities at Brunswick Harbor, Ga., and therefore report that the further improvement of the locality is deemed advisable to the extent of providing channels 27 feet deep at mean low water across

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the outer bar and 24 feet deep at mean low water inside, in accordance with the project recommended by the board and described above.

5. Assuming that Government plant will be available for doing the work proposed, as now seems probable, the estimated cost of the project recommended is $510,000 for first construction, $156,500 for maintenance operations during the time the channels are being excavated, and $50,000 annually thereafter for maintenance. The first appropriation should be $240,000, with subsequent appropriations of sufficient amount to complete the work in about three years. If for any reason Government plant should not be available for doing the work, the estimated costs will be approximately twice those above given; but even under this supposition I am of the opinion that the project is a worthy one.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS ON SURVEY.

[Second indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
July 13, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is submitted in review of the district officer's reports of preliminary examination and survey of Brunswick Harbor, Ga., with a view to securing increased depth of channel, authorized by the act of March 4, 1913.

2. Brunswick Harbor is understood to include the channel across the outer bar, through St. Simmons Sound, Brunswick River, East River to the upper limits of the city, Turtle River to the Southern Railway Dock, and that part of Academy Creek used by shipping interests. The distance from the city to deep water beyond the outer bar is 14½ miles.

3. The existing project, adopted by the act of March 2, 1907, has been practically completed. It provides for a channel depth of 30 feet at mean high water throughout, the width being 400 feet over the bar, 300 feet at Brunswick Point Shoal, 300 feet in Turtle River, 350 feet in East River, and 150 feet in Academy Creek; also for an extension of the training wall in East River and the construction of two spur dikes. The tidal range is 6.78 feet at St. Simons Island and 7.05 feet at Brunswick. The amount expended under previous projects was $697,879.25, and on the existing project to June 30, 1914, $660,594.69, making a total of $1,358,473.94.

4. The commerce of the port appears to have been increasing in proportion to the facilities afforded, and for the calendar year 1913 amounted to 1,009,007 tons, having a value of $58,246,425. It is stated that the tendency is for shippers to use vessels of the maximum draft available; that one crossed the bar drawing 26 feet 10 inches; and that others were used that could not be loaded to full capacity on account of insufficient depth.

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5. The improvement desired by local interests appears to be channel of adequate width, 30 feet deep at mean low water over th bar and 27 feet deep inside. An estimate is submitted for a channe of such dimensions, amounting to $1,218,000 for construction an $55,000 annually for maintenance. An estimate is also submitted fo a channel 27 feet deep at mean low water over the bar and 24 fee deep inside, amounting to $561,000 for first construction and $50,00 annually for maintenance. Both estimates are based on the assump tion that Government dredges may be secured for the work.

6. The district officer, who is also the division engineer, is of th opinion that the locality is worthy of some additional improvemen and he recommends the smaller of the projects mentioned in th preceding paragraph.

7. During the consideration of this subject a committee of th board visited Brunswick, conferred with local citizens, and made a inspection of the locality, and on June 29, 1915, a hearing was give at the board's office to representatives of the community.

8. It appears, from the information now available, that the por of Brunswick has been increasing in importance in recent years, an that a further development may be expected in the future which wi require additional harbor facilities. The depths heretofore mad available have been taken advantage of, and it seems reasonable t expect, with the larger vessels continually coming into use, that moderate increase in depth would be used if provided, and the boar believes that some further improvement is justified. Its investiga tions lead to the conclusion that a depth of 27 feet at mean low wate over the bar and 24 feet inside, including Brunswick Point Channe will be sufficient to meet all reasonable demands for present an immediately prospective commerce. Such an improvement woul cost, in round numbers, $510,000. In view of the foregoing, th board recommends that the existing project be modified so as to pro vide for the following:

(*a*) Bar Channel, 500 feet by 27 feet at mean low water.
(*b*) Brunswick Point Channel, 400 feet by 24 feet at mean low water.
(*c*) East River Channel, 350 feet by 24 feet at mean low water.
(*d*) Turtle River Channel, 350 feet by 24 feet at mean low water.
(*e*) Academy Creek Channel, 150 feet by 24 feet at mean low water.
(*f*) Cut from Academy Creek to Turtle River, if later decided advisable.

all at an estimated first cost of $510,000 and $50,000 annually fo maintenance after the completion of the project. It is expected tha maintenance will be required during construction to the extent o $156,500.

9. The work should be prosecuted with a view to its completion i about three years, the first appropriation to be $240,000.

10. In compliance with law, the board reports that there are n questions of terminal facilities, water power, or other subjects s related to the project proposed that they may be coordinated ther with to lessen the cost and compensate the Government for expendi tures made in the interests of navigation.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

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PRELIMINARY EXAMINATION OF BRUNSWICK HARBOR, GA.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Savannah, Ga., July 7, 1913.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Report on preliminary examination of Brunswick Harbor.

1. The river and harbor act approved March 4, 1913, calls for an examination or survey of Brunswick Harbor, with a view to securing increased depth of channel. The duty of making this examination was assigned to me by letter of the Chief of Engineers dated March 8, 1913.

2. The preliminary examination has been made under my direction by Asst. Engineer W. C. Lemen, and his report is transmitted herewith. Mr. Lemen has been stationed many years at Brunswick and has made personally nearly all the surveys that have been made since he has been there, and he is thoroughly familiar with the conditions that exist at this place.

3. The harbor of Brunswick was recently improved, under a project adopted in 1907, which had for its object the securing of a depth of 30 feet at mean high water. A channel of the proposed width and depth has been secured and maintained. At present it has shoaled so that its full dimensions are not available, but funds are on hand for its restoration. The harbor has responded to the improved facilities, and a large and valuable commerce is carried on at this place. Whether this commerce would be increased or benefited by an increased depth of channel remains to be determined. The desire of those interested in the harbor appears to be that the channel should be given a low-water depth on the bar of 30 feet and within the harbor, or in the sheltered portion a depth of 27 feet at low water. As the given rise and fall of tide is about 7 feet, this would mean a 37-foot channel at high water across the bar and a 34-foot channel inside. In other words, the existing channel would have to be deepened about 7 feet. It is evident that some deepening is very desirable to enable the improvement that has been made to be utilized to its fullest extent. The deep-draft vessels are those which are departing from the harbor rather than those that are arriving. It would be high water on the bar nearly an hour before it would be high at the upper limits of the city; therefore a ship which should leave its berth at high water would find only about half tide when it reached the bar. It would seem desirable, if it can be done within reasonable limits, to give such increased depth on the bar as would enable the full depth inside to be utilized. Whether the inside channel should be improved or not would depend very largely upon the cost of the improvement. We know the value of the commerce and can assume the difficulties under which it is carried on, and from this we could determine, approximately, what we can afford to pay in the way of betterment.

4. I would recommend that a survey be made and an estimate and report prepared.

5. An outline map [1] and seven photographs [1] accompany the report in a separate package. These photographs give a better idea of the

[1] Not printed.

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appearance of the harbor and the character of commerce than can be obtained from a description. Upon the outline map the viewpoint is given and the angle which it covers is indicated.

DAN C. KINGMAN,
Colonel, Corps of Engineers.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 23, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. For reasons stated herein, the board concurs with the district officer, who is also the division engineer, in recommending a survey in order to determine the extent and advisability of the improvement. It is requested that separate estimates be given for depths of 27 and 30 feet at mean low water on the bar and 3 feet less inside in each case.

For the board.

W. C. LANGFITT,
Lieut. Col., Corps of Engineers,
Senior Member Present.

REPORT OF ASST. ENGINEER W. C. LEMEN.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., June 25, 1913.

From: W. C. Lemen, Principal Assistant Engineer.
To: Col. Dan C. Kingman, Corps of Engineers, Savannah, Ga.
Subject: Report on preliminary examination of Brunswick Harbor, Ga.

1. In accordance with your instructions, the following report is submitted:

2. The river and harbor act approved March 4, 1913, calls for a preliminary examination of "Brunswick Harbor, Georgia, with a view to securing increased depth of channel." As the wording of the clause of this bill does not specify the extent of the improvement, a letter was addressed to Hon. W. G. Brantley, Representative from the eleventh district at the time of the introduction of this item and instrumental in the obtaining of the present improvement of Brunswick Harbor, requesting him to specify what was the intent or scope of the improvement contemplated by the parties making the request. From his reply and letters received from the Board of Trade of Brunswick and other interests, it is learned that the improvement desired is the deepening of the Brunswick bar and outer harbor to a depth of 30 feet at mean low water from the sea up to the anchorage basin in front of the quarantine station and 27 feet from this locality throughout the inner harbor and up to Turtle River Docks.

PRESENT LIMITS OF BRUNSWICK HARBOR.

3. The river and harbor act approved March 2, 1907, adopted the present project for improvement of Brunswich Harbor as outlined in House Document No. 407, Fifty-ninth Congress, first session, and defines Brunswick inner harbor as follows: "Embracing Turtle River from Southern Railway Docks to its junction with Brunswick River; Academy Creek, from Aikens Wharf to its junction with East River; East River and that portion of Brunswick River from Brunswick Point to its junction with East River." Brunswick outer harbor is defined as follows: "Embracing the outer bar, the navigable entrance to St. Simons Sound, up Brunswick River to Brunswick Point, where the inner harbor begins."

LOCATION.

4. Brunswick Harbor, Ga., located on the southeast Atlantic coast at the apex of the reentrant angle of the coast line, which angle has for its northern point Cape Hatteras, and for its southern point, Key West, is approximately midway

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between these two main changes in direction of the ocean thoroughfares followed by the coastwise trade of the Atlantic coast. On each side of this naturally protected harbor, at about equal distances, are the large ports of Jacksonville and Savannah. Fort Screven, a garrisoned fort, lies 92 miles to the north from the St. Simons entrance, and Fort Clinch, an old, unoccupied fort at the entrance of Cumberland Sound, is situated 30 miles to the south. The Altamaha River system connects with the inside waterway 12 miles to the north, and the Greater Satilla River 12 miles to the south, forming a water transportation line to the entire southeastern portion of the State of Georgia.

HISTORY OF PAST IMPROVEMENT.

5. The earliest reliable survey of the entrance to St. Simons Sound and the waterways forming the same was made in 1856 by the United States Coast Survey. The outer bar, which extends in a horseshoe shape across the entrance, has not materially changed in location or general direction of the sand movements since that time. The general depth on the bar was 15 feet in 1856, which shoaled to about 13 feet in 1879 or thereabouts, and in 1894 was found to be about 14 feet. Up to June, 1902, its improvement was carried on by direct contract between Congress and private individuals. The act of Congress approved June 13, 1902, appropriating $40,000, placed the improvement under the Engineer Department, which accomplished a channel 200 feet in width upon a straight line radiating from St. Simons Lighthouse, obtaining a controlling depth of 26 feet at mean high water. The river and harbor act approved March 3, 1905, called for a preliminary examination of Brunswick inner and outer harbor. This report was submitted under date of June 3, 1905, was approved, and a survey ordered. The report upon this survey was submitted under date of December 4, 1905, and adopted by Congress under river and harbor act approved March 2, 1907. This act appropriated $146,650 and authorized $350,000 additional to obtain a navigable depth of 30 feet at high water from deep water at the sea throughout the Brunswick inner and outer harbor, and is defined in the project printed under House Document No. 407, Fifty-ninth Congress, first session. The history of the improvement of Brunswick Harbor with reference to former descriptions and reports upon the same can be found in the Chief of Engineers' report for 1911, page 421. Briefly stated, it is as follows: Prior to June 13, 1902, the appropriations for the improvement under the Engineer Department were for the inner harbor only. The original project, dated April 29, 1876, provided for a jetty in the river in front of the city and provided for dredging at a cost of $69,000. Amount expended, $190,000. Under a subsequent project adopted in 1894 $34,817.25 was expended, making a total expenditure on this harbor, including various other small amounts appropriated as early as 1836, of $234,817.25 up to June 30, 1902. The act of Congress approved June 13, 1902, adopted a project of 21 feet at mean low water for the inner harbor, and 26 feet at mean high water for the bar, at a total cost of $165,000. Prior and up to the time of the adoption of a 30-foot depth at mean high water for the outer and inner harbor there had been expended on this harbor a total of $697,879.25. Since that time there has been appropriated under various acts $685,270.75, including all unexpended balances. These funds have accomplished and maintained practically up to this date a navigable depth of 30 feet at high water throughout the inner and outer harbors of Brunswick, with widths in the inner harbor varying from 150 feet in Academy Creek to 350 feet in East River, and in the outer harbor from widths of 300 feet on Brunswick Point Shoal to 400 feet on the bar.

6. The total cost of improving this harbor as a whole from one having an average controlling depth of 13 feet at low water to one with a depth of 23 to 24 feet at low water has been $1,383,150, including present balances on hand for maintenance work.

CHARACTERISTICS.

7. Brunswick Harbor, as it is officially known, comprises the waterways St. Simons Sound, Brunswick River, East River, Academy Creek, and Turtle River, only one being an alluvial-bearing stream, the rest being estuaries of the sea. A general idea of the size and capacity of the harbor is given by the following figures: Inside the harbor proper and up to the Southern Railway Dock, located at the extreme inner end, there is found an anchorage basin 7 miles in length, with a width of 300 to 3,000 feet, with depths ranging from 30 to 85 feet at

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mean low water, forming an area of 1,030 acres of water, landlocked and protected from heavy weather. Loading docks now existing in the inner harbor are situated from 11 to 20 miles from deep water outside the bar. The rise and fall of the tide ranges from 6.6 feet on the bar to 7.1 feet at the upper end of the harbor.

8. Brunswick bar is similar in general formation to those sand-formed shoals found upon the southeast Atlantic coast at the entrance to all harbors of more or less importance; with a general direction of flow to the southeast; with a series of sand ridges to the northward and southward; and in this instance, as in most others, the larger and shoaler bar is found on the north side. These north breakers are broken up into a series of shoals by northeast channels of varying depths. Evidences observed in the past and observations by weather facilities indicate that the prevailing on-shore winds throughout a calendar year in this section of the country is from the northeast, with a southeast trade wind next in proportion. These northeast winds have a tendency to keep open the northeast slue channels. The main flow of the water, however, is to the southeast, and after careful consideration, prior to the adoption of former reports, a line of best water was selected radiating from St. Simons Light, and the improvement heretofore accomplished has been made along this line. Annual studies of the sand movement since the commencement of the present project have confirmed the estimate of shoaling to the extent of 125,000 cubic yards annually, as made in the 1905 project.

9. A future further increase of this depth may very proportionately increase the cost of maintenance, due to various causes, mainly the fact that the general depth of the water to the north and south of this bar in the immediate vicinity of the improved channel is quite shallow, being as little as 1 foot within 1,500 feet to the north and 6 feet within 3,000 feet to the south. On one shoal, though, the depths to the south will average 15 feet within 5,000 feet. The creation of a deep channel in the immediate vicinity of these shoals will have a further tendency to increase the drag of sand from them, unless the total flow across the bar be concentrated along one line, causing increased channel velocities of such intensities as to carry out all material that may drift in from the northward or southward, and thus obviate any possibility of settlement occurring from the deposit of silt from fresh-water streams entering the sound or from the side shoals.

10. There is but one fresh-water stream entering directly into the formation of St. Simons Sound, namely, Turtle River, which carries very little sediment in suspension. The fresh-water stream that adds the greater proportion of bar-forming material to St. Simons Sound is the Altamaha River, 12 miles to the northward. Under the above physical conditions there is naturally very little silt-bearing water, the water in general being purely sea water, and the shoalings that do occur are mainly from sand movement of the coast bars. The waters of the Altamaha in time of flood stages find their way through the inside passage, especially from the South Altamaha branch out to the sea by way of St. Simons Sound, and should a series of flood years occur in the Altamaha increased sedimentation may be expected to occur on Brunswick bar. Owing to the exceptional success of the improvement of this bar by dredging alone in the past it seems probable that the further improvement of the same is possible by dredging, without any consideration being given to the possibility of the necessity of building either single or double jetties, in order to further increase the depth across this bar. Any investigation that may be authorized for future improvement will be carried out with this idea in view, namely, that the future improvement of the bar can be accomplished by means of dredging alone, the cost of the same being entirely dependent upon the class of material that is found to exist on the bottom strata of the material forming this bar. Within the limits of the outer harbor there is included the shoal at Brunswick Point, which in former projects has been improved to a depth of 23 feet at mean low water, with a width of 300 feet, connecting the 24-foot curves on each end. The depths adjacent to this channel are close to 20 feet, with a wide, flat area slowly shoaling on each side to 2 feet on the north side within 2,500 feet, but not decreasing to less than 15 feet within 5,000 feet on the south side, so that further improvement of the same presents no difficulties other than the removal of a certain amount of material by dredging in some manner. The side slopes will not be excessive, and doubtless the maintenance of the same will be small, judging from the action of this channel since the accomplishment of the improvement in 1908, there having been no dredging necessary to maintain this project depth

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nd width at this point for the last four years. A further concentration of the low along those lines may possibly mean a slight increase in maintenance for a ew years, but after the side slopes have assumed what may be considered a natural position, doubtless this channel will be self-maintaining.

11. The inner harbor, as defined at present, consists of the waterways Turtle iver up as far as the Turtle River Docks, East River from its junction with urtle River in front of the city proper, and Academy Creek along past the pper wharves of the city front. Turtle River is a broad, large stream with hree or four shoals of less depth than that under consideration but with mple tidal cross section to afford the creation of straight, improved channels hrough the same. The character of these shoals is very well determined from ast improvements to be a rotten limestone in strata formation, with heavy nud in the case of the lower shoal and cemented sand and shell in pocket brmation on the upper shoal. Two additional shoals will be probably encountered, judging from past surveys of the harbor, should the improvement contemplated be undertaken, the character of which is unknown. East River has n improved channel throughout the portion made use of 350 feet in width and 3 feet in depth. The further increasing of this depth is only a question of ardage. The character of the material forming the bottom of the same, lowever, is not known definitely. Indications are that a portion of it will robably be found to be sand and mud and portion similar in structure to the hoals found in Turtle River. Academy Creek was, prior to the improvement y wharves along its eastern shore, a stream of some 800 feet in width, very hoal, with deep natural holes at the first bend found in the same. Improvements have narrowed this down to a width of 500 feet. The maintenance of he proposed width and project depth in this waterway has been considerable; lowever, it is thought practical, from recent studies of the conditions, to obviate his present large cost of maintenance by making an opening from the upper leadwaters of this creek into Turtle River, diverting from the same in ebb tides ufficient water to create carrying velocities at the mouth where the shoaling exists and creating in times of flood a draft upon the water of East River ufficient to create carrying velocities, thus doing away with the dead water t its mouth and stopping the shoaling that has heretofore occurred at this ocality, the advisability of which is subject to further investigation. This art of the harbor probably need not be increased in depth to the extent that s considered necessary for the other portions of Brunswick Harbor, but presents no grave difficulties toward the accomplishment of a reasonable improvement.

COMMERCE, PAST, PRESENT, AND PROSPECTIVE.

12. In 1878 the total water-borne commerce of Brunswick was valued at $1,782,000, and in 1893, when the first improvements of Brunswick Harbor were started, this commerce was $5,600,000. In 1903, after the initial accomplishment of the opening up of Brunswick bar, this commerce had increased nearly five times, amounting to $29,172,000. In 1911 the commerce of Brunswick Harbor amounted to 704,252 short tons, valued at $44,506,731. The commerce as reported for the year 1912 (which may be considered the first year that this harbor has enjoyed a navigable depth of 30 feet at high water) has amounted to 725,597 short tons, valued at $45,664,904.

13. The greatest draft carried out over the bar was 27 feet—from the Turtle River Docks.

14. Whether or not Brunswick Harbor is worthy of further improvement by obtaining greater depths across its bar and inner shoals is dependent upon the attitude of transportation lines and forwarding agents making use of the harbor, consequently an expression from them has been sought and is shown by the accompanying letters, the general indication of which is a contemplated pronounced extension of the shipping from this port in the near future.

15. Another railroad makes its terminus here within the present year, developing a new steamboat line entirely, in addition to the extension of the F. D. H. Strachan & Co. shipments by larger and heavier draft vessels.

TERMINAL AND TRANSFER FACILITIES.

16. The total improved wharf frontage of Brunswick amounts to 15,000 linear feet, subdivided among forwarding agents, corporations, railroads, and transportation lines. Four railroads have termini at this port, namely, the Southern Railway, with direct lines from western connections and territory; the Atlantic Coast Line Railroad; the Atlanta, Birmingham & Atlantic Railroad; and the

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Georgia Coast & Piedmont Railroad. The Southern Railway has lately undertaken the development of its wharf frontage at this port, and has recently completed a special storage warehouse and freight-handling machinery, representing an investment of $70,000. In addition, this railway owns warehouses located on East River with a capacity of 7,300 tons and a floor space of 437,600 square feet. The Atlantic Coast Line Railroad owns 4,800 feet of wharf located on East River and Academy Creek, the greater portion of which has been sublet to forwarding agents handling principally lumber products and naval stores. The Atlanta, Birmingham & Atlantic's terminal, situated at the junction of East River and Turtle River, represents an investment of $900,000, with 129,400 square feet floor space under cover and 105,000 square feet of open dock. Of recent date these terminals have enlarged their cotton-storage facilities with a 150 by 800 feet cotton warehouse, which is to be further increased in the near future by doubling in length. They have expended for the maintenance of their slips within the last year in the neighborhood of $70,000 in dredging and construction work. The Georgia Coast & Piedmont Railroad has a water front of 2,000 feet, upon which it is contemplated they will develop terminal facilities as required. The municipality of Brunswick owns the foot of its streets abutting upon East River, amounting to a total linear length of 1,180 feet. Only five of these streets are available for use at present, due to the rest having been leased to various parties. At the foot of two of these streets there are maintained small docks and landings for the accommodation of the small shippers. Steps have been undertaken within the last 12 months to purchase, own, maintain, and operate sufficient wharf frontage for the accommodation of all shippers not able to obtain wharf facilities at other points in the harbor, the city's charter having been amended by the late State legislature in such a way as to make such steps legal.

WATER POWER.

17. The waterway under consideration being entirely a tidal estuary, the question of water-power development is not considered.

RÉSUMÉ AND RECOMMENDATIONS.

18. Brunswick is favorably located, both geographically and physically, for a deep-water port, owing to its closeness to the sea, its large natural anchorage basin, and freedom from silt-bearing water with bar-forming material. The maintenance after a project is once accomplished is naturally light. It has been, and is, capable of great improvement at a relatively small cost.

19. The extent to which the above-outlined requested improvement can economically be carried, with the cost of the same, can only be determined by a very thorough study of the ocean bar, including its past, present, and probable future condition; its currents and other physical data; and in addition a very careful determination of the character of the material comprising the shoals that will have to be removed.

20. In consideration of the response of commerce at this port in the past to improvements by the Federal Government (it having increased 66 per cent since the commencement of the present project and the export business having increased 31 per cent in the past year) it would appear worthy of a thorough survey in all respects to determine the cost of such an improvement, and the same is recommended.

W. C. LEMEN, *Assistant Engineer.*

LETTER OF GEORGIA COAST & PIEDMONT RAILROAD CO.

BRUNSWICK, GA., *May 26, 1913.*

DEAR SIR: In regard to the forthcoming report and preliminary survey of Brunswick Harbor with a view to obtaining greater depth, I respectfully submit for your consideration my view as to the necessity for greater depth from the standpoint of my company, the Georgia Coast & Piedmont Railroad Co. We have made a very careful study of Brunswick before determining to spend the very large sum of money involved in the extension of our line from Darien, Ga., to Brunswick. Very great care is exercised nowadays by the investing capitalists before putting money into new railroads. The very fact, therefore, of the heavy investments being made in the Georgia Coast & Piedmont extension would indicate that we made clear to capitalists the attractive possibilities of the line with an outlet at Brunswick.

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My company has bought and now owns 2,000 feet of water front on East River at Brunswick, which we will develop as rapidly as the business of our line indicates to be necessary and wise. We expect to handle a very large tonnage over these docks. We will form with our railroad a sea outlet for five independent railroads of middle Georgia with which we are, or shortly will be, connected, and which have no port connections over their own rails.

Our ability to divert a heavy tonnage over our lines to Brunswick will depend to a very great extent upon the ocean freight rates from the port of Brunswick. A vital factor in ocean freights is the question whether a ship may load to her capacity, or whether she must load to less than her capacity on account of insufficient water; to wit, a ship of 26 feet draft or over can not safely be loaded to more than 23 or 24 feet at Brunswick, hence such ships charge higher freight than they would charge if they could load to their capacity. It is becoming very common at Brunswick now for ships of great draft, such as 26, 28, 29, and 30 foot, to leave Brunswick light; according to my information, 4 during the last 30 days have done so.

The channel at Brunswick is 23 feet at mean low tide across the bar and throughout the harbor at present. This makes no allowance for the rise and fall of vessels in the rougher water at the bar. The practice nowadays, we believe, is to maintain a greater depth in the rougher waters outside harbors as an allowance for "squat." I take the liberty of suggesting, therefore, that in my opinion conditions and commerce at Brunswick require a channel depth of at least 30 feet at mean low tide across the bar and up to the quarantine station. From the quarantine station throughout the inner harbor I think 27 feet at mean low tide would be ample depth. This improvement would provide for the development of commerce at Brunswick for a period of 8 or 10 years at least, in my opinion.

In closing I direct your attention to the rapid growth of Brunswick's waterborne commerce. The Government statistics carry full information to substantiate the statement that the percentage of increase in the commerce of Brunswick is greater than that of any South Atlantic port. I am informed that the railroads leading into Brunswick are enjoying a remarkable increase of tonnage in and out of Brunswick.

This information is submitted in the hope that it may be of interest and assistance to you.

Very respectfully, yours,

A. DE SOLA MENDES,
Vice President and General Manager.

Col. DAN C. KINGMAN,
Corps of Engineers.

LETTER OF MALLORY STEAMSHIP CO.

NEW YORK, *N. Y., May 19, 1913.*

DEAR SIR: I am informed that a preliminary survey and examination of the harbor of Brunswick is now being made, and as this company owns and operates steamers to that port, I wish to bring to your attention the necessity for deeper water there.

The insufficient depth of water at Brunswick has been brought forcibly to our attention, as steamers find it difficult to operate the channel, and we are compelled to assign vessels of lighter draft to that line, thus limiting the cargoes that may be safely handled.

The commerce of the port of Brunswick is increasing rapidly—has increased about 50 per cent in the last 10 years—and decided improvements have been made by the rail lines terminating at the port; therefore, in order to keep up with this progress and handle the increasing volume of business, we feel strongly that the depth of water on the bar at mean low tide should be 30 feet, with at least 27 feet from quarantine station to the Turtle River Docks, also in the East River.

I trust that the result of the present survey and examination will justify you in recommending that necessary work be done to secure the depth of water mentioned.

Yours truly,

H. H. RAYMOND,
Vice President and General Manager.

Col. DAN C. KINGMAN,
Corps of Engineers.

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LETTER OF SOUTHERN RAILWAY CO.

BRUNSWICK, GA., *May 20, 1913.*

DEAR SIR: In support of a contemplated movement for the improvement of the harbor and inflowing rivers at Brunswick, I would like, on behalf of the company I have the honor to represent, to call your attention to facilities we have established at the port for the promotion of its shipping interests, as well as the volume of traffic handled by us.

That this company in the beginning realized that this port would play an important part in the development of the shipping on the South Atlantic is proven by the acquirement of valuable river-front property, which comprises 75 acres just north of the quarantine station, 7 acres in the heart of the city, and 275 acres at Turtle River. All three of these tracts are available for future development, but the first has not been improved. On the tract in the city proper we have located our warehouse for the handling of merchandise of a general nature, with a capacity of 2,000 tons; a warehouse 60 by 340, of 4,000 tons' capacity—60 by 240 of this space is assigned for bonded freight under United States customs; a warehouse 00 by 200, capacity 1,300 tons, used for the storage of salt and also for accommodation of commodities hauled by small river craft. In addition, we have 900 feet river front, with a shed 300 by 400, and one 250 by 300 which is used for the storage of forest products awaiting shipment by vessel.

At our Turtle River property we have made the greatest development, and it is here that most of our imports and exports are handled. Our storage for cotton is 15,000 compressed bales, divided into three compartments by up-to-date fire walls and equipped with modern fire-protection apparatus. Our track facilities will accommodate an additional 10,000 bales in cars and leave room for switching. Our present facilities for handling commodities other than cotton comprise four buildings with total capacity of 6,000 tons, and are also equipped with modern fire-protection apparatus. There is now under construction, and will be completed by August 1 of the present year, an up-to-date concrete-base building of 25,000 tons' capacity, which will be equipped with the most modern electric handling apparatus and automatic weighing attachment. This building is so constructed that it can be made three times its present capacity with adequate handling apparatus for the enlargement. It will be used for imported fertilizer material, and when completed will leave available for other commodities the warehouse formerly used exclusively for that commodity.

Recently a special representative was sent to the ports by the Interstate Commerce Commission to investigate conditions and obtain first-hand information as to the ability of the various rail lines to take care of whatever increased shipping might develop with the opening of the Panama Canal. He was shown about the property and facilities of this company and expressed gratification that this company was so well equipped for expansion.

During the cotton season of 1911–12 this company handled over its wharves approximately 400,000 bales, all of which were exported, and we brought into Brunswick about 25 per cent of the 25,000 bales which were handled at other wharves coastwise.

Available figures show that water-borne traffic at this port increased from $1,782,000 in 1878 to over $50,000,000 in 1912, and there is perhaps no one agency that had contributed as much in the development of this increased commerce as the Southern Railway. Year by year and month by month our tonnage and revenue have increased. Taking our last monthly figures for April, we show as follows: Increase over March, 108 carloads; over April, 1912, 368 carloads, or 11,040 tons.

It is shown from the above that the Southern Railway has not only in the past been an important factor in the development of the traffic at this port but is showing its confidence in the future by continued expenditures on its facilities. However, we feel that future development must be handicapped unless a greater depth in the harbor is attained, and in order that full development may be had this company strongly urges as a minimum depth at mean low tide 30 feet across the bar and up to quarantine and 27 feet at mean low tide from quarantine to Turtle River Docks and in East River.

Yours, respectfully,

SOUTHERN RAILWAY CO.,
Per J. B. MCLAUGHLIN,
Acting General Agent.

Col. DAN C. KINGMAN,
Corps of Engineers.

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LETTER OF MR. J. H. LEO.

BRUNSWICK, GA., *May 20, 1913.*

DEAR SIR: Being informed that the shipping interests of Brunswick are endeavoring to have Brunswick Harbor deepened to 30 feet across the bar and up to Brunswick Point throughout the inner harbor, it occurs to me that you will be interested to know my views on this matter, since I began running into this port 26 years ago, and since then have been a resident of the city for 13 years.

I am of the opinion that the greater depth as indicated will not only be a benefit to Brunswick and to the shipping interests of the port generally, but that it is necessary for reasons as follows: Sailing craft of smaller draft are disappearing from the seas. This decrease in the smaller craft began in a gradual way many years ago. In recent years the scarcity of smaller sailing craft is more marked each year. This class of craft is being replaced very rapidly by steamships of greater draft and capacity, and the tendency is to increase the draft of the steamships and their capacity. This is a very natural evolution of commerce, since ocean freight rates increase as the carrying capacity of ships increases. The tonnage of commerce has increased so rapidly and so vastly, particularly within the past 10 years, that the larger ships of greater tonnage and draft have become necessary, and, of course, the shipping companies are meeting that demand by the construction of the greater ships. It is my experience that the development of our ports, particularly on the South Atlantic and Gulf, is not keeping pace with the development of greater ships.

This is proved in the case of Brunswick by the fact that forwarding agents have, in a number of cases, had to decline to charter ships that were available owing to the draft of water. In the past 30 days we have had two barges in this port which could not be loaded to their capacity owing to the draft of water, and for that reason the freight rate on their cargo was above normal. It appears now that the heavy percentage of our coastwise business of the future will be handled in these barges and deep-draft vessels.

Within the past 30 days we have had a boat of the Palmer Line which had to leave loaded light for the same reason; also the *M. D. Cressey*, now bound to this port, can not load to her capacity either. The rapid disappearance of the smaller vessels compels the use of these vessels of greater draft, in spite of the fact that a high freight rate must be paid for their use because of the inability to load them to capacity.

Trusting that this information will prove a benefit and interest to you, I am,

Very respectfully, yours,

J. H. LEO.

Col. DAN C. KINGMAN,
Corps of Engineers.

LETTER OF THE BOARD OF TRADE OF BRUNSWICK, GA.

BRUNSWICK, GA., *April 22, 1913.*

In re Survey of Brunswick Harbor.

DEAR SIR: Mr. J. G. Weatherly, of the Brunswick Board of Trade, has replied, under date of April 17, to your favor of the 15th instant in regard to preliminary examination of the Brunswick Harbor, as authorized by the act of Congress approved March 4, 1913. Mr. Brantley has also sent us copy of his letter of the 16th instant to you.

As Mr. Weatherly and Mr. Brantley have advised you, it was the sense of the members of the Brunswick Board of Trade at the time they adopted the resolution requesting Mr. Brantley to procure passage of the bill authorizing a survey of the harbor that the best interest of the port would require a depth of 30 feet at mean low tide across the outer bar and up to the quarantine station, and a depth of 27 feet at mean low tide from the quarantine station throughout the inner harbor and to the Turtle River Docks. In connection with other projects, the secretary has already furnished you considerable data with respect to the present and prospective commerce of the port. He will, however, give you a comprehensive report covering this subject at an early date. We trust that the Engineering Department will concur in the view of the member of our board and make the preliminary examination for the purpose of ascertaining the cost of obtaining the depths suggested.

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Thanking you for the very cordial cooperation which you and the other officers of the Corps of Engineers have always manifested in this matter, I am,

Yours, very truly,

F. E. TWITTY,
Chairman Harbor Committee.

Mr. W. C. LEMEN,
Assistant Engineer.

LETTER OF MR. W. G. BRANTLEY.

ATLANTA, GA., *April 16, 1913.*

MY DEAR SIR: I am in receipt of your letter of the 15th instant, and carefully note same.

The provision for a further survey of the Brunswick (Ga.) Harbor, contained in the last river and harbor bill, was made to read, "With a view of securing increased depth of channel." The language originally agreed upon was somewhat different, but at that time the idea was simply to obtain a survey for an increased depth on the outer bar, with a view of equalizing the depths inside and outside, made necessary by the rough water outside. It was subsequently determined to enlarge the survey somewhat, and the idea then and now is to have a survey looking to an appropriation to obtain 30 feet of water at mean low tide across the outside bar and up to the quarantine station, and 27 feet of water at mean low tide from the quarantine station throughout the inner harbor and up to the Turtle River docks of the Southern Railway. The language of the survey authorization is in general terms, but is supposed to be broad and comprehensive enough to cover a survey as I have outlined it.

This is what is wanted. I beg to hope that in making your preliminary examination you will make it with that end in view.

Thanking you for your interest and kind attention, I am,

Very truly, yours,

W. G. BRANTLEY.

Col. DAN C. KINGMAN,
Corps of Engineers.

LETTER OF THE BOARD OF TRADE OF BRUNSWICK, GA.

BRUNSWICK, GA., *April 17, 1913.*

DEAR SIR: Your letter dated April 15, requesting an expression from the Brunswick Board of Trade of the underlying intent of the extent of the improvement of Brunswick Harbor sought to be obtained by the provisions of the river and harbor act approved March 4, 1913, which provides for a preliminary examination of Brunswick Harbor, with a view of obtaining increased depth of channel, has been received.

You are correct in assuming that the provision of the river and harbor act as inserted by Hon. W. G. Brantley, former Congressman from this district, had its origin with the Brunswick Board of Trade. The needs of the harbor were very thoroughly discussed at a number of meetings.

It was very generally agreed that a greater depth of channel from the sea to Turtle River docks, including East River, was imperatively necessary. But it was agreed that the channel over the outer bar should be deeper than the channel of the inner harbor, as an allowance for the rise and fall of vessels or their squat, as occasioned by rougher water of the more exposed portions of the harbor and the open sea; therefore Congressman Brantley was urged to have the language of the survey authorization in general terms comprehensive enough to cover a recommendation for a survey looking to an appropriation to obtain 30 feet of water at mean low tide across the outer bar and up to the quarantine station, and 27 feet of water at mean low tide from the quarantine station up to the Turtle River docks of the Southern Railway and in the channel of East River.

Trusting that this will be the information desired by you, we are,

Very cordially, yours,

THE BOARD OF TRADE,
J. G. WEATHERLY, *Secretary.*

Col. DAN C. KINGMAN,
Corps of Engineers.

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LETTER OF THE SOUTHERN RAILWAY CO.

WASHINGTON, D. C., *May 31, 1913.*

DEAR SIR: The interest of this company in the development of the South Atlantic and Gulf ports prompts me to offer a few suggestions bearing on the proposition for increasing the depth of water in the harbor at Brunswick, Ga.

The tendency of the present day is in the direction of the construction of larger and deeper ocean-going steamships, and a depth of water in an important harbor like that of Brunswick, which would have been ample a few years ago, will be inadequate in the near future. With the approach of the completion of the Panama Canal, we may look forward to a large increase in the volume of traffic through our South Atlantic and Gulf ports, and it is of the highest importance that their harbors shall be deep enough to accommodate the largest vessels that will engage in trade through the canal. I believe that this consideration alone is sufficient to justify the adoption of the proposed project for the improvement of the harbor at Brunswick.

I may point out further that, leaving the Panama Canal out of consideration, the commerce of Brunswick is increasing so rapidly as to justify asking the Federal Government to improve the harbor to the highest possible state of efficiency. Figures published by the Division of Statistics in the United States Department of Commerce and Labor show that both imports and exports through Brunswick are increasing more rapidly than the imports and exports of the United States as a whole.

In the fiscal year 1902, the total value of imports through Brunswick amounted to $33,097. In the fiscal year 1912 their total value was $76,618, an increase of 131 per cent, as compared with an increase of 83 per cent for the United States as a whole.

The value of exports through Brunswick in the fiscal year 1902 was $7,338,808. In 1912 the value was $19,889,838, an increase of 171 per cent, as compared with an increase of 59 per cent in the value of exports from the United States as a whole.

The coastwise commerce and the traffic of the railway lines serving Brunswick are also increasing. For the 10 months ended April 30, 1913, the Southern Railway Co. received at Brunswick 88,427 tons of freight and forwarded from Brunswick 24,456 tons of freight.

This company anticipates a further development of business through the port of Brunswick, and is now improving its terminal facilities at that port by the construction of a large warehouse designed for handling kainit and similar materials with a mechanical installation consisting of movable hoisting towers which have a capacity of not less than 40 tons of kainit per hour, and with appliances by which the kainit and similar materials can be handled directly from vessels in the harbor to cars without storing in the building.

Hoping that this letter may be of some use to you in consideration of the project for the further improvement of the harbor of Brunswick, and that the matter may be acted upon favorably, I am,

Yours, truly,

N. W. FINLEY, *President.*

Col. DAN C. KINGMAN,
Corps of Engineers.

SURVEY OF BRUNSWICK HARBOR, GA.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Savannah, Ga., March 8, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Report on survey of Brunswick Harbor, Ga.

HISTORY AND LOCATION.

1. Under date of July 7, 1913, my predecessor in charge of this office submitted a report upon preliminary examination of Brunswick Harbor, called for in river and harbor act approved March 4,

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1913. This preliminary examination recommended a survey of Brunswick Harbor with a view of determining estimates of cost of suitable improvement, such survey being necessary therefor. This recommendation was concurred in, and the Board of Engineers for Rivers and Harbors in its recommendation requested that separate estimates be given for depths of 27 feet and 30 feet at mean low water on the bar and 3 feet less inside in each case. The work was assigned to this office by letter from Office of the Chief of Engineers, dated September 25, 1913. The survey has been completed, and its results are shown on map in five sheets herewith, sheets 1 to 4 showing the ordinary hydrographic features and sheet 5 the location of hard material.

2. The report on preliminary examination and its appendices contain full description of the limits of the harbor and its location. The only feature which might be added is the fact that four railroads serve the port, as follows: The Southern Railway, of 7,485 miles; the Atlanta, Birmingham & Atlantic Railway, of 625 miles; the Atlantic Coast Line Railroad, with 4,322 miles, and the Georgia Coast & Piedmont Railroad, a 100-mile trunk line connecting Brunswick with five independent lines whose total length exceeds 600 miles.

SURVEY.

3. This survey includes not only the ordinary hydrographic and topographic features but also includes borings over a large area, as indicated on the maps, on account of the existence of hard material which had previously been discovered. Borings were made at distances of approximately 200 feet apart over all areas where it will be necessary to remove material to accomplish the improvements outlined, except on the bar, and these borings were carried down in nearly all cases to a depth of at least 1 foot below the proposed improvement. No borings were taken on the bar because of the fact that the character of the material existing there had already been determined by previous borings and dredging. The survey was made under the supervision of Mr. W. C. Lemen, assistant engineer, who designed the very successful boring apparatus used. From his very full report, appendix to report on preliminary examination, and from report made by Mr. M. V. Haas, junior engineer, this report as to the physical features and results of the survey is largely taken.

TIDAL DATA.

4. All elevations in this report refer to the local mean low water plane established by records from tide gauges maintained at different times on St. Simons Island and at Brunswick. The datum plane used at present is the one last established in 1909 by E. R. Conant, United States assistant engineer, and checked in 1912 by W. C. Lemen, United States assistant engineer, from tide-gauge records and level lines. The rise and fall of the tide at Ocean Pier, St. Simons Island, is now taken as 6.78 feet, and that at Brunswick as 7.05 feet.

WIND AND SAND MOVEMENTS.

5. A study of the controlling forces and movements of the sand was made by Lieut. Thomas H. Rees, Corps of Engineers, in 1890, and as no meteorological records have been kept since that time, and

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as there is every reason to believe the meteorological conditions in this vicinity to-day are practically the same as they were in 1890, the following data and statement as quoted from Lieut. Rees's report are applicable to Brunswick bar as it exists to-day: "Records of the directions and velocities of the winds at St. Simons entrance were obtained from the reports of the lightkeeper at St. Simons Lighthouse. These cover a period of three and one-half years, beginning January, 1888"; and from these records a wind diagram has been made and is shown on the map of the bar accompanying this report. From this diagram the following facts are apparent: "Northeast, east, and southeast winds are on-shore and have the greatest effect on the shoals and shore line. North and south winds are approximately parallel to the shore line, but still have some effect in moving the sands. Southwest, west, and northwest winds are offshore and can have but little effect in wave action except within the entrance. They do, however, sweep large quantities of sand that have been heaped on the sand dunes by the on-shore winds back into the sea. It may be seen from the wind diagram that the prevailing direction of the on-shore winds is northeast, 20 per cent of all the winds being from this direction. Their average velocity is also greater than that in any other direction, which gives to them a relative effect equal to 26½ per cent of the whole. The winds that produce a southerly motion of sand along the coast, viz, north and northeast winds, occur on an average 86 days in one year and have a relative effect of 29 per cent. South and southeast winds, which produce a northerly movement of the sands, occur on 50 days, with a relative effect of 16 per cent; and east winds, which probably produce an inward movement of sand toward the entrance from both sides, occur on 10 days, with a relative effect equal to about 2½ per cent of the whole. The resultant direction of the wind-wave forces is therefore toward the south, and the positions and forms of the outlying shoals are such as would be expected with a southerly movement of the sand along the coast. Northeast winds are most frequent during the fall and winter months; southeast winds are most frequent during the summer months. Heavy gales are of rare occurrence, their prevailing directions being from southeast and northeast. The northeast gales are generally of longer duration than those from other directions."

6. From the foregoing and from recent observations it is found that the prevailing winds in the vicinity of Brunswick bar and a predominance of the storms come from the northeast and southeast, but that these are not regions of long-continued storms or high winds. It has been found that Brunswick bar is an exceedingly slow one to change, and after careful study this bar has up to this time been improved by dredging alone. A study of the bar with a view of improving the channel by the construction of jetties was made and a report submitted by Capt. C. E. Gillette, Corps of Engineers, in 1900. This report is printed in House Document No. 355, Fifty-sixth Congress, second session, and the theory that Brunswick bar could be most economically improved by dredging alone has been verified by the experience of the past 15 years. Owing to the success of the improvement and maintenance of this bar by dredging, it can be concluded that any further improvement can also be carried

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out most economically by dredging, without consideration being given, for the present, to jetties in order to further increase the depth across the bar or maintain the channel in a fixed position.

7. The following changes have taken place on the bar in the last 14 years, as shown by a study of comparative contours: The point of St. Simons Island between the lighthouse and the hotel has cut away 250 feet since 1900 and about 500 feet since 1891, and the slough channel near the shore has narrowed from 1,000 feet to 400 feet and moved inshore about 1,000 feet where this action is taking place most rapidly. During the last six months the property owners along this beach line have constructed a spur dam of piling extending to low water and with its top about 3 feet above high water, and have also constructed a piling and timber bulkhead for about 1,000 feet along this beach. The 24-foot contour in the ebb-tide pocket about 8,000 feet from St. Simons Lighthouse, along the center line of the channel, has advanced almost parallel to the existing dredged channel a distance of 1,000 feet since 1900, and the 12-foot contour in this pocket has advanced about 3,000 feet due east since 1900, thus showing a decided tendency for an auxiliary channel to form at an angle of about 25° to the existing channel. About 22,000 feet from St. Simons Lighthouse, along the center line of the present improved channel, the 12-foot contour on the crest of the bar has moved toward the channel about 700 feet since 1900 and about 1,400 feet since 1891. This southerly movement of the sand is making the maintenance of the channel at this point more difficult from year to year, and if the annual rate of progression of this shoal to the southward continues the cost of maintenance of the bar channel at this point will be necessarily increased. On the south side of the channel and over the south shoals no important changes have taken place except a slight general sand movement to the south and a slight cutting away of the point of Jekyl Island. Considered as a whole, the bar shows only very minor changes in the period covered.

8. *Material on Brunswick Bar.*—Three reports on the character of the material of the bar have been made in the past by Lieut. Thomas H. Rees, Corps of Engineers; Mr. Bacon, assistant engineer; and Mr. Conant, assistant engineer. In addition, during the present project dredging has been carried to depths of 24 to 25 feet in isolated localities, and from all this information it has been concluded that no material will be found on the bar that can not be removed by seagoing dredges.

9. *Material at Brunswick Point crossing.*—An examination made of the material on the Brunswick Point crossing disclosed the existence of an area 900 feet long, with an average width of 100 feet on the south side and at the lower or eastern end of the channel, where refractory material is encountered. This material is for the most part a gritty argillaceous sandstone of coarse texture, with occasional strata of coquina. It occurs in strata from 2 to 6 inches thick, with intervening layers of gravel, mud, and sand. There seems to be no regularity about the depths and thicknesses of the various strata of rock, and none of them covers the entire area. There is almost invariably a stratum of rock from 2 to 6 inches thick underlying the surface drift of sand and mud, which is usually less than 1 foot thick, and underlying this top crust is a deposit of mud, sand, and

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ravel, and then other sandstone strata, at varying depths and of arying thicknesses. A portion of this refractory material has been moved under the present project by means of explosives and an range-peel bucket, and a portion by the seagoing dredge *Savannah*. nother area of refractory material, about 2,000 feet long, is found t the extreme upper or western end of this channel. The material countered at this point is coarse sand and clay, with scattered rock rata from 2 to 4 inches thick, and is similar to the sand rock found t the other end of this channel; but very little of this refractory terial is encountered above elevation 27. The remainder of the terial on this crossing is mud and sand, which is very easily re-oved by a seagoing dredge.

10. *Material in Turtle River.*—Three shoals are found in Turtle iver, with a depth less than 27 feet. The lower shoal, for a length 3,600 feet, is composed of refractory material, and the remainder the shoal is sand which can be easily removed. The refractory terial in this shoal is, for the most part, a soft gray shale, occur-ng in thin strata, with clay and sand deposits between. The mid-le shoal consists of shell, sand, and mud, with a stiff clay deposit vering the west half of the channel for almost the entire length of e shoal. The upper shoal has two deposits of refractory material, vering a total length of channel of 2,800 feet, consisting of a coarse-ained sandstone in strata from 1 to 6 inches thick and occasional rata of coquina, with intervening deposits of sand and shell. The mainder of the shoal is sand and shell and is easily dredged.

11. *Material in East River.*—There are two places at the lower end f East River, near its junction with Turtle River, where refractory terial is encountered. These two deposits cover a total length of annel of 2,200 feet, and are composed of a soft brown and gray ale very similar to that found in lower Turtle River Shoal. The mainder of the material in East River which it would be necessary remove to provide a 27-foot channel is sand, shell, and mud, which n be easily and economically dredged.

12. *Material in Academy Creek.*—No investigation of the material rming the bottom of Academy Creek was made, as it has been nproved under previous projects to a depth which is sufficient to tisfactorily indicate that no hard material will be found.

PRESENT PROJECT.

13. The following is a condensed statement of the present project—l depths are 30 feet at mean high water:

(a) Channel, from deep water outside to deep water inside the bar, 400 feet ide.
(b) Channel across Brunswick Point Shoal, 300 feet wide.
(c) Channel in Turtle River to Southern Railway Dock, 300 feet wide, rough three shoals; natural depths and widths exceeding the project dimen-ons elsewhere.
(d) Channel in East River, 350 feet wide.
(e) Channel in Academy Creek, 150 feet wide.
(f) Extension of the existing training wall in East River.
(g) Construction of two spur dikes.

As in all similar projects, continuous maintenance will be necessary, nd is now estimated at $33,250 per year, the project having been mpleted. The mean rise and fall of the tide is said to be 6.6 feet

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on the bar, 7 feet at Brunswick Point, and 7 feet at the city c Brunswick. The present project, therefore, provides for practicall 23 feet on the bar and 23 feet inside as the completed depths. Th new estimates called for, therefore, provide for an increase of abo 1 foot and 4 feet, respectively, inside and 4 feet and 7 feet, respe tively, on the bar.

HEARINGS.

14. On January 19, 1915, I held a hearing at Brunswick, Ga., fo the further discussion and submission by the Brunswick Board o Trade of data showing the necessity for further increase in chann dimensions of Brunswick Harbor. The information was submitte almost entirely in writing, copy attached hereto. The papers sub mitted are all interesting and valuable and throw much light upo the situation. The main conclusion to be drawn from them, it ap pears to me, is that there is a large territory which is naturally tri utary to Brunswick Harbor, and this harbor should have sufficien facilities to take care of the commerce outgoing therefrom and com ing thereto. Considering the amount and character of the com merce and the character of the vessels, it also seems clear that an change in the existing project should include a wider channel acros the bar. The present width of 400 feet is not considered sufficien for a channel across an ocean bar maintained solely by dredging, with out the aid of jetties, and a 500-foot width is recommended. Insid it is believed 400 feet should be adopted at Brunswick Point crossing which is an increase of 100 feet in the present project in width Turtle River, also being wide and the channel so narrow in compar son, it is believed that 350 feet in width should be adopted as fa up as the Southern Railway terminals; and in East River and Acad emy Creek the present project widths should be maintained—35 feet and 150 feet, respectively. Based on these dimensions for width the following estimates are given of the amount of material and cos of its removal for forming the channels indicated above; that i 27 feet and 30 feet on the bar and 24 feet and 27 feet inside respectively.

15. *Table of cost, 30 feet on the bar and 27 feet in inner harbor.*

Locality.	Width of channel.	Depth.	Yardage.	Unit cost.	Amount.	Remarks.
	Feet.	*Feet.*		*Cents.*		
Brunswick bar	500	30	5,791,000	12	$694,920	Easily dredged.
Brunswick Point	400	30	1,279,600	10	127,960	Do.
			93,200	60	55,920	Hard material.
Turtle River	350	27	351,900	10	35,190	Easily dredged.
			151,200	60	90,720	Hard material.
East River	350	27	582,300	10	58,230	Easily dredged.
			42,600	60	25,560	Hard material.
Academy Creek	150	24	186,200	10	18,620	Easily dredged.
			8,478,000	.....	1,107,120	
Contingencies	.....	.....	.....	.....	110,880	
Total	.....	.....	.....	.....	1,218,000	

This table shows that there are 287,000 cubic yards of hard mate rial, and, exclusive of the bar and Brunswick Point, 1,120,400 cubi yards of easily dredged material to be removed. From experienc

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with the dredge *Morgan* in Savannah Harbor, a dredge of similar construction and capacity could remove these amounts and the additional amount to take care of maintenance in two years.

There would remain of easily dredged material, on the bar and at Brunswick Point, 7,070,600 cubic yards. Assuming that two dredges of the capacity of the *Savannah* are available, five years would be required for the work, including the additional excavation needed for maintenance. The easily dredged material at Brunswick Point is put with the bar, to give a place for the seagoing dredges to work when weather conditions are prohibitive on the bar. All three dredges would have to be obtained from other works, and allowance for rental has been made in the unit prices. If done by contract, based on present conditions, these estimates should be increased to 25 cents per cubic yard for the bar and to 15 cents per cubic yard for soft material and $1 per cubic yard for hard material for inside work.

Table of cost, 27 feet on the bar and 24 feet in inner harbor.

Locality.	Width of channel.	Depth.	Yardage.	Unit cost.	Amount.	Remarks.
	Feet.	*Feet.*		*Cents.*		
Brunswick Bar	500	27	3,122,500	12	$374,700	Easily dredged.
Brunswick Point	400	27	632,900	10	63,290	Do.
			22,700	60	13,620	Hard material.
Turtle River	350	24	38,800	10	3,880	Easily dredged.
			21,300	60	12,780	Hard material.
East River	350	24	211,600	10	21,160	Easily dredged.
			2,100	60	1,260	Hard material.
Academy Creek	150	24	186,200	10	18,620	Easily dredged.
			4,238,100	.....	509,310	
Contingencies	.....	.....	.....	.....	51,690	
Total	.....	.....	.....	.....	561,000	

Exclusive of the bar and Brunswick Point, there are 46,100 cubic yards of hard material and 436,600 cubic yards of easily dredged material to be removed in the inner harbor. A dredge similar to the *Morgan* could remove this material in one year, including any additional amount properly chargeable to maintenance. This leaves for removal 3,755,400 cubic yards of easily dredged material on the bar and at Brunswick Point. With two dredges of the capacity of the *Savannah* three years will be required, including additional time needed for work properly chargeable to maintenance.

As for the previous estimate, all these dredges would have to be obtained elsewhere, and rental allowance has been made in the unit prices. If done by contract, based on present conditions, these estimates should be increased to 25 cents per cubic yard for the bar and to 15 cents per cubic yard for soft material and $1 per cubic yard for the hard material for inside work.

16. Owing to the relatively large amount of bar work in both projects, it is believed that it would be more economical to build the necessary dredges, with the increased cost entailed thereby, than to carry out the work by contract.

17. By looking at the map it will be seen that the approach to the Turtle River Docks can be made by way of East River without any

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increase in distance. To do so would require dredging to the adopted depth of the connection between the upper end of the improved East River Channel and the upper part of the improved Turtle River Channel. To make this connection would require excavation as follows:

	Cu. yds.
For channel 350 feet by 27 feet	2,754,783
For channel 350 feet by 24 feet	1,994,874

costing, respectively, at 10 cents, $275,478.90 and $199,487.40. These figures are somewhat in excess of the cost by way of Turtle River and as the maintenance would also undoubtedly be greater this route is not considered worthy of further consideration.

MAINTENANCE.

18. It has been shown in preceding paragraphs of this report that the sand movements on Brunswick bar are very slow and that very little suspended matter is carried into Brunswick Harbor by alluvial streams. For these two reasons the maintenance of the improved channels has up to the present time been small, and since the completion of the present project the annual maintenance charge for the entire harbor has been $33,500 per annum.

19. The annual amount of shoaling on the bar was estimated at 125,000 cubic yards when the present project was adopted. From January, 1912, to December 1, 1914, it has been necessary to remove 350,000 cubic yards of material from the bar, and it is estimated that there remains 150,000 yards to be removed to fully restore the channel to project depth and width. This gives a total of 500,000 cubic yards that it would have been necessary to remove to maintain the bar channel for a period of three years. Taking the foregoing figures as a basis, it has been necessary to remove 170,000 cubic yards of material annually from the bar in order to maintain the bar channel. An increase in depth of the bar channel to 30 feet will increase its length by 30 per cent, and an increase in depth to 27 feet will increase its length by 20 per cent, and the annual rate of shoaling will probably increase in a like proportion, making an estimated annual shoaling for a 30-foot channel of the same width as the present channel of 220,000 cubic yards and an estimated annual shoaling for a 27-foot channel of 204,000 cubic yards.

The annual rate of shoaling on the Brunswick Point crossing, as shown by records of the past three years, is about 30,000 yards per year, and any further increase in depth should not materially increase this amount.

20. The Turtle River Channels have shown very slight shoaling since their completion under the present project, and with the improvement contemplated the annual shoaling should not exceed 10,000 cubic yards per annum.

21. The East River Channel has shown an average annual shoaling for the last three years of about 30,000 cubic yards per year, and with the improvement contemplated, after the side slopes of the channel have assumed their natural inclination, the annual shoaling should not exceed this amount.

22. The Academy Creek Channel has shown an average annual shoaling of about 60,000 cubic yards, and in view of the large con-

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inuous shoaling which takes place in this creek some consideration as given to the advisability of cutting a canal of some size from Academy Creek at its upper end through to Turtle River, with a view f allowing a greater flow of the water up and down the creek, which s now, practically, a cul de sac. However, due to the relative tidal levations in Academy Creek and Turtle River, probably but little enefit would ensue. At the same time, as such a canal 12 feet deep nd 100 feet wide would cost but a few thousand dollars, it can be cut t any time and can be taken care of within the estimates given. It hould tentatively be considered as part of any new project to be efinitely taken up without further legislative action, if further study hould lead to a decision that its construction is advisable. As nother method of aiding in preventing the deposits in Academy reek, it has been suggested that a dike be extended down from the pper side of the junction of Academy Creek and East River, so as o deflect the larger portion of the flood tide up Academy Creek s compared with what goes now through East River toward Turtle iver. If constructed of stone, such a dike would cost probably 50,000 to $75,000. It is believed that the interest on this sum would ore than dredge any reduction in the shoaling due to the construcion of the dike. It is therefore not recommended.

23. While these figures show a relatively small amount of dredgng for maintenance, I am of the opinion that even for present dimenions of channel width the amounts given would be exceeded. Taking nto further account the increased width recommended for the bar, Brunswick Point and Turtle River Channels, a still further increase n estimated maintenance work is necessary. On the whole, I believe n estimate based on 450,000 cubic yards yearly would probably be afe. Allowing for contingencies and office expenses, this could probably be removed for $55,000. This amount is therefore submitted as the estimated annual maintenance charge for the deeper hannels. For the lesser channel depths, $50,000 may be considered s sufficient.

COMMERCIAL STATISTICS.

24. In 1878 the total water-borne commerce of Brunswick was alued at $1,782,000, and in 1893, when the first improvements of Brunswick Harbor were started, this commerce was $5,600,000. In 1903 after the initial accomplishment of the opening of Brunswick Bar, this commerce was increased nearly five times, amounting to $29,172,000, and in 1911 the commerce of Brunswick Harbor amounted to 704,252 short tons, valued at $44,506,731. The commerce for the year 1912, which may be considered the first year that this harbor has enjoyed a navigable depth of 30 feet at high water, amounted to 725,597 short tons, valued at $45,664,904, and the commerce for the year 1913 amounted to 1,009,007 short tons, valued at $58,246,425, showing an increase of approximately 25 per cent in tonnage and valuation over the previous year. The principal commodities handled through the port of Brunswick are lumber, crossties, naval stores, and cotton, these four commodities comprising about 87 per cent of the total. Practically all cotton is exported to foreign countries, and the other products are shipped both export and coastwise.

25. The Mallory Steamship Co. has weekly sailings from Brunswick to New York, and there are local steamboat lines giving daily

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service as far north as Darien and as far south as Fernandina. There is also a line making weekly sailings up the Satilla River and numerous small craft employed in local business between Brunswick and points on the inside water route and interior rivers. During the cotton-shipping season, which covers a period of about seven months the Strachan Shipping Co. has, as a rule, three sailings per month to Liverpool and three per month to Bremen, with occasional sailings to other European ports. The general tendency of shippers is to use vessels of maximum safe draft for this port, and in the last year there have been vessels which have been unable to take on a full cargo because the present depth of the harbor was not sufficient to accommodate them when fully loaded. The maximum draft carried over the bar during the last calendar year was 26 feet 10 inches.

26. From the foregoing information it is seen that the commerce of this port has increased in proportion to and almost simultaneously with the improvements made. Several new manufacturing plants have located in Brunswick in the past year, including a creosoting plant, with an estimated annual business of $800,000 per year, and three shrimp-canning factories, with an estimated annual business of $500,000 per year. The creosoting plant contemplates making practically all shipments of creosoted products by water, and the shrimp factories have created a fishing industry in which there is already engaged about 30 power boats of various types. A new steamboat line, navigating the Altamaha River from Macon, will make Brunswick its ocean terminal within the next year, and upon the return or normal trade conditions the Baltimore & Carolina Steamship Co. contemplates the establishment of a line to Brunswick, with two sailings per month. There is no definite data yet at hand concerning the commerce of Brunswick for the past 12 months. There has, of course, been a large decrease in the volume of trade, due to the unusual conditions now existing, but from a study of the past history of Brunswick and the data relating to its prospects it is believed that the commerce of this port will show a steady growth as soon as normal conditions return. Interesting details may be found in the appendix.

27. Except as herein given, no further information of importance has developed since the report on the preliminary examination was made. Questions of water power, terminal and transfer facilities, etc., are covered therein. There are no conditions which seem to demand local cooperation, as the channels covered are main channels of approach.

RECOMMENDATIONS.

28. Considering all the circumstances as set forth in the report on the preliminary examination and herein, I am of the opinion that the adoption of a new project for Brunswick Harbor is worthy to be undertaken by the General Government, the smaller of the two projects herein considered to provide as follows:

(*a*) Bar Channel, 500 feet by 27 feet at mean low water.
(*b*) Brunswick Point Channel, 400 feet by 27 feet at mean low water.
(*c*) East River Channel, 350 feet by 24 feet at mean low water.
(*d*) Turtle River Channel, 350 feet by 24 feet at mean low water.
(*e*) Academy Creek Channel, 150 feet by 24 feet at mean low water.
(*f*) Cut from Academy Creek to Turtle River, if later decided advisable.

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The dimensions of channel recommended are suitable at high water
r vessels drawing 29 feet and at mean low water for vessels draw-
g 23 feet. The estimated cost of this work is $561,000, and is based,
s already indicated, on the supposition that suitable dredges can be
tained from other works for the necessary time.

29. In accord with the preceding recommendations the following
hedule of appropriations by years should be followed, with a view
completion in three years:

First year: $240,000 for operation of three dredges and $33,250 for maintenance present project; total, $273,250.
Second year: $161,000 for operation of two dredges and $40,000 for maintenance of present project; total, $201,000.
Third year: $160,000 for operation of two dredges and $50,000 for maintenance; total, $210,000.

W. C. LANGFITT,
Colonel, Corps of Engineers.

[For Report of the Board of Engineers for Rivers and Harbors survey see p. 3.]

BRIEF ARGUMENT FOR ADDITIONAL DEPTH OF HARBOR AND CHANNELS AT BRUNSWICK, GA.

[Submitted by the Brunswick Board of Trade, Jan. 19, 1915. J. G. Weatherly, secretary.]

1. In asking the United States Government to deepen, widen, and otherwise prove the channels of Brunswick Harbor we are suggesting an improvement at will be of vast benefit to the large area of the Southeastern States, one at can be obtained at a minimum cost, and the necessary expenditure for hich must inevitably prove an economy.

2. The benefits which will accrue to the territory embraced within the States f Georgia, Tennessee, Alabama, South Carolina, and a portion of Arkansas as result of Brunswick Harbor improvement could possibly be obtained in a easure by similar extensive improvement of any south Atlantic harbor, such s those of Savannah, Ga., or Jacksonville, Fla.; but they can be more cheaply tained by the improvement of Brunswick Harbor and the increased depth f water more economically secured and maintained in Brunswick Harbor han any other south Atlantic harbor or, indeed, than at any deep-water port n the Gulf or Atlantic coasts. This fact is so well known to the engineer in harge of this district and to the Board of Engineers that it is superfluous to ncorporate herein the actual figures of cost of harbor work and maintenance f the different ports.

3. The railway connections into and out of Brunswick are such that the disances by rail from Brunswick to the chief manufacturing and distributing enters of the Southeastern States are shorter than from any other south tlantic port. Attached hereto marked "Exhibit A," is a schedule of mileage istances from south Atlantic ports to the principal manufacturing and disributing centers of Georgia; also attached hereto, marked "Exhibit B," is a ale of mileage distances to the principal manufacturing, concentrating, and istributing centers of Alabama and Tennessee. The improvements sought for runswick Harbor are demanded by the needs of the commerce of the port nd directly affect the large area of territory that is and can be served through he port of Brunswick.

4. The vessels that now enter and leave Brunswick Harbor are using the ailable depth to the utmost limit; that is, the draft of vessels that enter and ave the harbor is necessarily limited by the depth of the harbor channels, nd the draft of such vessels is now the maximum that our depth of water an accommodate. We submit for your consideration a list of vessels exceeding 2 feet draft entering and leaving Brunswick Harbor during the calendar year 914, showing the draft of each. (Table marked "Exhibit C.") Regarding his table, however, it should be stated that the Brunswick pilots' office, from hose records it is compiled, has no complete data of drafts greater than 28.5

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feet, for the reason that the board of commissioners of Brunswick Harbor ha ing provided pilotage charge for no greater draft than 23.5 feet the pil keep no complete record of any greater drafts, hence a number of vess shown in Exhibit C as only 23.5 feet actually left the harbor drawing grea drafts up to 27.5 feet.

5. The immersion of vessels entering Brunswick Harbor, particularly vess of the Leyland Line, is regulated by the depth of the harbor channels, and present the full limit of immersion of vessels can not be used, and it will n be possible for it to be used until Brunswick outer harbor is deepened to feet at mean low water and the inner harbor deepened to 27 feet at mean l water and the channels considerably widened.

6. Cotton, which forms the chief article of export from most southern por is a commodity of which the bulk is large in proportion to its weight, but t Southern, and more particularly the Southeastern States, have become enormo producers of heavy-weight commodities, of which the weight is large in prop tion to their bulk. Among such commodities may be named phosphate, pig iro steel, steel billets, steel rails, agricultural implements, steel and iron rods, e

7. The shallowness of South Atlantic ports is such that the exportation these commodities of great weight but small bulk is forced through unnatu channels of travel. The deep water existing at the ports of New Orleans a Norfolk gives those ports an advantage in this respect over all South Atlan ports, notwithstanding that the South Atlantic ports are practically as ne Birmingham by rail as New Orleans and much nearer by rail than Norfol while the distance by water from South Atlantic ports to European destin tions is considerably shorter than from New Orleans; and as regards Chatt nooga, Tenn., and Gadsden, Ala., both (as well as Birmingham) importa centers of production of the heavy-weight goods indicated above, Brunswick much nearer by rail than any other port on the Atlantic or Gulf coast.

8. Brunswick exports annually an average of about 300,000 bales of cotto In value, cotton is one of the chief items of Brunswick's commerce; in weig of tonnage, however, it is one of the least important items handled throu Brunswick Harbor, amounting approximately to only 75,000 tons annually. T remaining 925,000 tons of commerce moving through Brunswick Harbor a nually is made up of heavy commodities, including exports of lumber, crosstie naval stores, steel and iron, and steel and iron products; imports of gener merchandise from New York and other eastern ports; and canned goods a manufactured products from Pennsylvania by way of Philadelphia and Bal more, and of salt, kainit, manure salts, etc., from foreign countries. The heavy-weight commodities, especially lumber, crossties, and salt, must move, at all, at the lowest possible freight rates.

9. The barges and coastwise tramp steamers used for the transportation (particularly) lumber and crossties are taking at this time the maximum loa allowed by the depth of the harbor channels. Many of them in the class the barge *City of Washington* have a cargo capacity of from 2,000 to 5,000 mo crossties than they have ever been able to carry out of Brunswick, owing the depth of water precluding their being loaded to their full immersio These barges and coastwise tramp steamers are chartered at flat or "roun sum-charter" rates; therefore it is manifest that if they can not be loaded t their maximum limit the cost per tie or per foot of lumber for transportatio to the eastern crosstie and lumber markets is greater than it otherwise would b

10. The schooner and barge coastwise ocean freight rates establish the coas wise steamer rates, therefore the cheaper the ties and lumber can be tran ported by barge the cheaper the rates of transportation on these commoditie will be by coastwise tramp steamer. It is also true that if deeper draft tran Atlantic steamers can safely enter and leave Brunswick, affording lower freigh rates by reason of their great capacity, their competition must produce a re sultant general reduction in ocean freight rates from South Atlantic and Gul ports to and from ports in foreign countries. This is a good illustration of on of the ways in which deeper water in Brunswick Harbor will benefit not onl Brunswick and the territory it serves, but also Gulf ports and other southe ports, together with the territory they respectively serve.

11. Brunswick is in a geographically logical situation to care for the heav tonnage of iron and steel, both raw and manufactured, that emanates from th manufacturing centers of Birmingham, Ala., Gadsden, Ala., and Chattanooga Tenn., being connected with these three centers by direct lines of railway an being nearer by a number of miles to all of them, as shown by Exhibit B, tha any other South Atlantic port. There can be no doubt that the tonnage fro

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these cities which Brunswick cares for at the present time will be heavily increased when her harbor is so deepened and improved that vessels of greater draft can enter and leave it than is now possible. These two factors of shorter rail distances and shorter ocean distances, combined with the removal of the restriction as to depth of loading that would be accomplished by deeper water, must obviously cheapen transportation from these sources of origin to European points of consumption, and such economy in transportation effected through Brunswick will naturally be reflected on the general transportation rate situation, and so diffuse its beneficent effect over a large area, whose extent can not be even guessed at at present. It is pertinent to again draw attention here to the comparatively low cost of deep water and its maintenance at Brunswick.

12. The commerce of Brunswick has invariably shown an immediate response to every improvement made at the port, and the great increase of Brunswick's commerce in tonnage and value since the completion of the 30-foot project in 1912 fully justifies our request for greater improvement. Brunswick statistics for the year 1913, the first full calendar year to elapse since the completion of the 30-foot project, shows more than 1,000,000 tons of commerce, of a value of more than $50,000,000; and since by far the greater part of this commerce is carried by deep-draft vessels, the importance of further deepening Brunswick Harbor is obvious.

13. At several of the South Atlantic ports the greatest item of tonnage is contributed by coastwise steamship lines, whose vessels are usually of light draft, not exceeding 20 feet. Brunswick has but one line of coastwise steamers of light draft, and the tonnage it handles is in but small proportion to the general tonnage of the port, therefore Brunswick tonnage figures have great significance in the matter of the necessity for deeper water.

14. It is the experience of the agents of trans-Atlantic steamship lines at Brunswick that they have had at various times to decline to charter deep-draft vessels offering to them, because of the lack of depth in the harbor channels; this, however, is not a frequent occurrence, for the reason that shipowners are necessarily usually well informed regarding the facilities and accommodations of the different ports, and naturally refrain, as a matter of general practice, from offering vessels to land at Brunswick which can not be safely handled here.

15. It must also be remembered that the drafts of laden vessels vary according to the weight of their cargo, so that the draft of a vessel whose load line allows of an immersion of, say, 30 feet when loaded to her greatest capacity may be so regulated by the nature of her cargo as to be immersed to a much lesser extent; and in this way vessels whose utmost load line makes them too deep for Brunswick's present water can and do enter the port, but in so doing are restricted to the lighter articles of cargo and can not take on the full quantum of heavier articles that their capacities permit.

16. It is axiomatic that the ideal cargo of a steamer, from the standpoint of efficient economy in cost of ocean transportation, is one whose weight and measurement are such as to completely fill her cubic space and at the same time procure an immersion to the utmost extent of her load line; therefore, any restriction that prevents such a cargo being laden has the automatic effect of increasing the cost of transportation of her cargo, besides debarring Brunswick from enjoying that free movement through her port of heavier articles of commerce produced at geographically and logically adjacent points to which she is justly entitled, and which the increased depth of water now sought would permit her to entertain, but which at present she can only accommodate, if at all, in a strictly limited degree.

17. It is of considerable significance that there are already two deep harbors on the Gulf coast and several on the North Atlantic coast; and if the South Atlantic ports are to hold their own in the active and ever-intensifying competition for ocean shipping, there must be deep-water harbors on the South Atlantic seaboard. As already recited, the character of Brunswick Harbor is such that it can be made such a deep-water harbor more cheaply, both as to first cost and also as to subsequent maintenance, than the harbor of any other South Atlantic port.

18. A heavy movement of structural steel, steel, iron, steel rails, wire, and other similar products from steel and iron centers in the South, is already setting in toward South American and Pacific coast points, and other destinations reached through the Panama Canal. These commodities manufactured in the South are in open competition with the older and larger established manufacturers located in the East, primarily from the Pittsburgh district and

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eastern seaboard. In order for them to compete from a transportation standpoint it is essential that the competitive conditions surrounding the water portions of the transportation are put on a parity with such transportation from the eastern seaboard. This can only be done by providing a sufficient depth of harbor at South Atlantic and gulf ports, equivalent to those on the eastern seaboard, thereby enabling the economic use of the carrying capacity of the vessels from South Atlantic and Gulf ports, so that they may compete as to the cost of ocean transportation. The harbor of Brunswick is susceptible to improvement to the extent desired at less cost than any other port, and also very much less as to maintenance.

19. The effect of the European war will in time be to increase the export of the products named in paragraph 18 to South America. Germany and England, up to the opening of the European war last August, had a practical monopoly of South American trade. The European war has already diverted some of this trade to the United States, and it matters not who the conqueror may be in the European war, the United States will be eventually a heavy gainer in world trade. The opening of the Panama Canal is another factor which will tend to increase our trade with South America, more particularly with the west coast of that continent. The great South American lines sailing between the United States and South America make New York their American or home port, but with Brunswick Harbor deepened as suggested Brunswick undoubtedly will become a port of call, since she will be the only South Atlantic port with the depth sufficient for them to enter and leave safely. As an illustration of the possibilities of this South American trade, the steamship *Kentra*, of the American-Brazilian Line, cleared from Brunswick Harbor October 3, 1914, having on board 6,000 barrels of rosin consigned from Brunswick to South America. Five thousand barrels of this rosin were loaded on board the *Kentra* at Brunswick, but it was found after the *Kentra* came into this harbor that she had on board 1,000 barrels of rosin consigned from Brunswick to Brazil, and this rosin had been sent from Brunswick to New York by water, loaded on board the *Kentra* in New York, and in turn again came into Brunswick Harbor drawing 26 feet 10 inches, a record of which we were proud, and which we were careful to keep out of the papers until after she cleared the bar, because we were in doubt as to whether she would safely navigate the channels of the harbor.

20. The opening of the Panama Canal has already resulted in a heavy movement of traffic between the Atlantic and Pacific coasts by water through the canal in competition with the transcontinental rail lines. This commerce is growing rapidly. The character of the ships now engaged in this service in regular lines have a draft of from 23 to 29 feet. Much of this commerce moving to and from Southeastern States naturally tributary to Brunswick is carried past Brunswick to New York and then transshipped by coastwise steamers to the various South Atlantic ports because of the inability of the vessels of greater draft to enter any of these ports in their original depths, necessitating the redistribution from New York in vessels of lighter draft, thereby adding to the cost of commodities to the consuming and producing territory and depriving this section of the country of the geographical advantage it should enjoy.

21. The approximate total area of Brunswick Harbor is 31 square miles. Within this area inside of the harbor proper, up to the Southern Railway Docks located at the extreme inner end, there is an anchorage basin 7 miles in length, with a width of 300 to 3,000 feet, and with depths of water ranging from 30 to 40 feet at mean high water, forming an area of 1,030 acres of land-locked water naturally protected from storms. Therefore, when the channels of the harbor are sufficiently deepened the harbor will become as valuable for the United States Navy as the most southerly deep-water harbor on the Atlantic coast, and, if necessary, could be advantageously used by them as a refuge harbor. The character of the entry to the harbor makes it easy of defense against an attacking enemy, and the large anchorage basin, given sufficient depth of water, would make it possible for many warships to lie safely at anchor. This particular feature of the advantages afforded by Brunswick Harbor is now the subject of discussion with the Navy Department, but it has not been sufficiently developed at the present time to warrant our making any statement here of the attitude of the department regarding it.

22. Attached hereto, marked "Exhibit D," will be found a transcript of the remarks of Mr. E. T. Lamb, receiver and general manager of the Atlanta, Birmingham & Atlantic Railroad, submitted verbally to Col. W. C. Langfitt at Brunswick the evening of January 19, 1915.

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23. Attached hereto, marked "Exhibit E," will be found a transcript of the remarks of Mr. R. B. Pegram, general agent Southern Railway Co., headquarters at Charleston, S. C., submitted verbally to Col. W. C. Langfitt at Brunswick the evening of January 19, 1915.

24. Attached hereto, marked "Exhibit F," will be found a transcript of the remarks of Mr. C. Lee Cook, president of the Brunswick Creosoting Co., submitted verbally to Col. W. C. Langfitt at Brunswick the evening of January 19, 1915.

EXHIBIT A.

Short mileage distances, showing number of lines used, from South Atlantic ports to chief manufacturing, distributing, and concentrating points in Alabama and Tennessee.

To—	From Brunswick.	Number of lines used in computing mileage.	From Savannah.	Number of lines used in computing mileage.	From Charleston.	Number of lines used in computing mileage.	From Jacksonville.	Number of lines used in computing mileage.	Ports enjoying short mileage and cheap haul.
	Miles.		*Miles.*		*Miles.*		*Miles.*		
...ma	348	1	333	3	362	3	404	1	Brunswick, Savannah.
...ens	292	2	278	1	253	2	349	2	Savannah, Charleston.
...mille	191	3	135	1	221	2	234	4	Savannah.
...dersville	179	4	138	2	218	3	232	4	Do.
...nta	275	1	260	3	309	2	330	1	Brunswick, Savannah.
...gusta	204	4	150	1	138	1	259	5	Brunswick, Charleston.
...lin	247	2	234	1	337	2	315	2	Savannah.
...nan	314	2	270	1	348	3	351	2	Do.
...dgeville	219	2	188	1	230	2	289	2	Do.
...con	187	1	173	2	263	2	254	1	Brunswick, Savannah.
...blin	156	3	119	2	249	3	215	2	Savannah.
...ynesboro	170	4	99	1	159	2	186	1	Do.
...esboro	120	3	52	2	168	3	197	3	Do.
...lla	118	2	80	1	195	2	167	3	Do.
...lehurst	85	1	106	1	223	3	142	1	Brunswick.
...tman	130	1	132	2	248	3	186	1	Do.
...Grange	287	1	278	3	380	3	308	2	Savannah.
...mbus	258	3	266	1	363	3	287	2	Brunswick, Savannah.
...t Valley	214	2	201	3	292	3	239	2	Do.
...thbert	193	3	240	3	254	3	232	3	Brunswick.
...ney	170	1	203	2	324	1	188	1	Do.
...bam	185	1	224	1	328	2	178	2	Do.
...ton	129	1	168	1	283	1	147	1	Do.
...ltrie	152	2	191	2	306	2	152	2	Brunswick, Jacksonville.
...omasville	161	1	200	1	316	1	153	2	Do.
...ldosta	118	1	157	1	272	1	110	1	Jacksonville.
...inbridge	197	1	236	1	352	1	179	2	Brunswick, Jacksonville.
...ycross	58	1	97	1	212	1	76	1	Brunswick.
...ughs	97	1	125	2	230	2	110	2	Do.
...wkinsville	158	1	157	3	273	4	199	3	Do.
...tzgerald	126	1	154	2	268	2	147	2	Do.
...lmore	118	2	79	2	196	3	168	3	Savannah.
...rdele	163	1	168	1	283	2	184	2	Brunswick, Savannah.
...erieus	196	2	199	1	314	2	224	2	Do.

EXHIBIT B.

Short-rail mileage distances, showing number of lines used, from south Atlantic ports to chief manufacturing, distributing, and concentrating points in Alabama and Tennessee.

	Miles.
Savannah to Montgomery via Seaboard Air Line Railroad, 1-line haul	338
Brunswick to Montgomery via Atlantic Coast Line Railroad, 1-line haul	369
Brunswick to Montgomery via Atlanta, Birmingham & Atlantic and Seaboard Air Line Railroads, 2-line haul	332
Charleston to Montgomery via Atlantic Coast Line and Seaboard Air Line Railroads, 2-line haul	443

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	Miles
Jacksonville to Montgomery via Atlantic Coast Line, Seaboard Air Line, and Atlanta, Birmingham & Atlantic Railroads, 3-line haul	35
Brunswick to Birmingham via Atlanta, Birmingham & Atlantic, Seaboard Air Line, and Central of Georgia Railroads, 3-line haul, short route	41
Brunswick to Birmingham via Southern Railway, 1-line haul	44
Jacksonville to Birmingham via Atlantic Coast Line, Atlanta, Birmingham & Atlantic, Seaboard Air Line, and Central of Georgia Railroads, 4-line haul, shortest route	43
Savannah to Birmingham via Central of Georgia Railroad, 1-line haul	44
Savannah to Birmingham via Seaboard Air Line and Central of Georgia Railroads, 2-line haul	41
Charleston to Birmingham via Southern Railway, 1-line haul	60
Charleston to Birmingham via South Georgia Railroad and Southern Railway, 3-line haul	47
Charleston to Knoxville via Southern Railway, 1-line haul	49
Brunswick to Knoxville via Southern Railway and Louisville & Nashville Railroad, 2-line haul	47
Savannah to Knoxville via Seaboard Air Line, Macon, Dublin & Savannah, Southern, and Louisville & Nashville Railroads, 4-line haul	45
Jacksonville to Knoxville via Seaboard Air Line and Louisville and Nashville Railroads, 2-line haul	52

NOTE.—Atlanta and Birmingham being the gateways through which Memphis Chattanooga, Nashville, Gadsden, Knoxville, and other similar situated cities are reached from the south Atlantic coast. Brunswick has the same advantage of short mileage to those places as it enjoys to the gateways.

A 1-line continuous haul is cheaper than a haul of same or slightly greater distance over more than 1 line. Thus the haul from Brunswick to Knoxville is cheaper than from Savannah to Knoxville.

EXHIBIT C.

Steamer.	Draft. Ft.	In.	Steamer.	Draft Ft.	In
Jamaican No. 2	27	0	Belgian	23	
Kentra	26	10	City of Delphi	22	1
Memphian	26	7	Nessian	22	
Anglo Canadian	25	9	Mercian	22	
Meltonian	25	8	Anglo Saxon	22	
Atlantian	25	3	Jamaican	22	
Colonian	25	1	Drumcliffe	22	
Indian	24	10	Ninian	22	
Navarra	24	9	Thistleban	22	
William Cliff	24	6	Memphian	22	
William Cliff	24	5	Memphian	22	
Roanoke	24	3	Meltonian	22	
Glenetive	24	0	Nitonian	22	
Memphian	23	10	Gafsa	22	
Ethelstan	23	10	Antillian	22	
Nortonian	23	4	Anglo Colombian	22	

EXHIBIT D.

REMARKS OF MR. E. T. LAMB, RECEIVER AND GENERAL MANAGER, ATLANTA, BIRMINGHAM & ATLANTIC RAILROAD.

1. I had hoped you would call on Mr. Pegram first, because of his more intimate knowledge and longer acquaintance with this situation than it has been possible for me to acquire in the period of time I have been associated with it. I am, however, very glad to be with you this evening, as I know of nothing of more importance to the tonnage-producing section of the Southeast than that of deeper water at the port of Brunswick, the absence of which has greatly handicapped those sections from participating on the same basis with respect to ocean rates to the large export markets in competition with tonnage-producing sections working through other ports north of us.

2. Some years ago our company, as you know, built at great cost a low-grade line from one of the largest tonnage-producing sections of the Southeast, namely Birmingham into Brunswick. The principal object they had in view was the

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oving of this heavy traffic from that point to this port for exportation to reign countries. The inability to secure rates on a relatively low basis as re in effect at ports north of us has not only resulted in the movement of a naller amount of this traffic through the port of Brunswick than it was justly titled to but in many instances large orders have been lost to the tonnage-roducing sections of the Southeast which their geographical position entitled lem to, these orders going to the more northern or eastern ports by reason f the movement of larger, deeper-draft, and therefore more economically oper-ted steamers from those ports as compared with those the depth of water ould admit of being operated from the port of Brunswick.

3. In order to meet these conditions and give to the Southeast that which its ographical position entitles it to it would seem that the time is now at hand hen the depth of water at Brunswick should be such as would enable a ship f equal draft being loaded to that of any other port in the United States. runswick's large area of harbor, its close proximity to the sea, the saving in me consumed in getting to and from its docks, the small amount involved in rrying to a completion the project referred to, and the economic maintenance hereof would seem to justify favorable consideration of what this port is king at the hands of the United States Government. It is evident that the mount already expended and the small amount necessary to complete the pro-osed project would bring about greater returns than has been the case at ighboring ports. The report of the Chief Engineer for the United States for 914 shows that the expenditures to date at the ports named and the move-ent through same were as follows:

City.	Total amount expended to June 30, 1914.	Project.	Commerce for calendar year 1913.	
			Tonnage.	Value.
cksonville	$6,306,562.30	30 feet, low water	2,562,043	$71,244,501
unswick	1,408,328.00	30 feet, high water	1,009,026	58,258,725
annah	10,609,178.11	26 feet, low water	3,154,089	306,536,275
arleston	5,158,776.90	28 feet, low water	1,043,058	79,225,772

4. When you take into consideration the fact that in addition to the possi-ilities offered through this port for export and its right of participation to a rge extent in the movement of traffic from the east to the west through the anama Canal, and the further fact that the distance from Liverpool to the trance to the Panama Canal via Brunswick is 5,172 miles as against 6,075 via ew Orleans, and from New York via Brunswick 2,496 miles against 3,376 a New Orleans, it would seem to justify the conclusion that this is the logical int at which steamers plying between New York and the Pacific coast can uch at minimum cost and delay, by reason of this port's accessibility to the urse of these ships, as well as to the railroads running to and from the nnage-producing sections of the Southeast, from and through which there is large movement of traffic seeking such an outlet.

5. One of the most important questions now having the consideration of the rmingham shippers concerns the possibilities which the Panama Canal offers participating in the furnishing of traffic consumed on the Pacific coast, a nsiderable part of which is being supplied from the Far East at less cost an it is possible for them to get under present conditions in the absence of eper water at this port, which it is so much in need of. With the depth of ter you are seeking, it will not only develop a large movement of heavy nnage from the Southeast, but will enable this section of the country to rticipate in its share of traffic which its geographical position entitles it to, d do away with the necessity of this country, or any part of it, seeking reign countries for a class of traffic which it is daily producing in large lumes but meeting with great difficulty in securing markets for, owing to e lack of sufficient depth of water at this port to accommodate ships of such pacity as will enable the handling of same at minimum cost, and on a basis at will compare favorably with that in effect from the large producing sec-ons in the vicinity of Pittsburgh, moving through the ports of the East.

6. With the improvement at this port such as you are now seeking, there is reason why the movement should not only grow from these large producing

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sections of the Southeast but also augment the movement from points beyon which is the natural territory from which its business should move. I am i hopes, therefore, that this project can not only be put through but carried t an early and prompt completion, particularly in view of the amount necessar as compared with what would be required at other points.

EXHIBIT E.

REMARKS OF MR. R. B. PEGRAM, GENERAL AGENT, SOUTHERN RAILWAY CO.

1. The Brunswick Board of Trade invited Mr. W. W. Finley, the late pres dent of the Southern Railway Co., to visit Brunswick on April 29 and 30, 191 to assist in presenting Brunswick's argument to Col. Kingman for a preliminar survey looking to the feasibility, expense, etc., of deepening and improving th channel and harbor at Brunswick. Mr. Finley's engagements prevented hi from accepting the invitation, and he directed me to attend the meeting and len such assistance as I could in presenting their argument. At that time the ide was to present Brunswick's claims for channel and harbor improvements i such a convincing way as to secure a favorable recommendation for a prelim nary survey by the Board of Engineers.

2. I understand the preliminary survey has now been made, and that it ind cates that the proposed improvement and deepening of the Brunswick Chann and Harbor can be accomplished very economically, and that the subsequen cost of maintenance will be equally as economical.

3. I will not undertake to deal with or comment upon the engineering fe tures, because any comment, criticism, or suggestion by me would be unauthor tative and unconvincing and, I may say, impertinent, as the Engineers are be qualified to determine these matters and get at the facts; neither will I unde take to deal with statistics of trade and commerce, as your secretary has con piles these much more elaborately and accurately than I could, having at hi disposal both Government and local statistics.

4. I will therefore confine my talk to two questions that I can speak of fro experience, and possibly with some authority:

5. First. The question of traffic conditions in the South as they are to-da and which are now undergoing a very decided development and revolution.

6. Second. The question of economic water transportation and its relation t the development of commerce in the section of the country served by the Sout Atlantic ports.

7. These two questions are inseparable; the growth of traffic or commerce ca not be greater than the growth of transportation facilities. The facilities mus be kept ahead of the commerce; otherwise that commerce will be restricted an bounded by the lack of transportation facilities. This is true of our interna commerce, and the railroads have been taxed to the utmost to provide trans portation facilities sufficient to meet the growing commerce of this section of th country by providing more and better track, heavier bridges, cars of greate capacity, engines of greater power, and, above all, larger and more commodiou terminal facilities. The failure to provide adequate terminal facilities woul to a large extent nullify the effectiveness of all other advancements and im provements in rail transportation.

8. Our commerce, however, can not be confined to geographical boundarie and to the coast line. After we supply our own needs we must dispose of ou surplus abroad and to neighboring countries and States, and we must buy fron them the things which we do not produce. Transportation by rail is an infan when compared with transportation by water. The sea has always been th open highway for commerce. There are no questions of construction an maintenance of tracks and of roadways to be contended with, but the grea questions of equipment and motive power and of terminal facilities (in th form of ships, channels, and harbors) are as vital to marine commerce as the are to rail commerce.

9. The same economic conditions which have brought about more powerfu locomotives and cars of greater capacity in rail transportation have caused th construction of larger and deeper and more powerful ocean-going steamships and this in turn has necessitated the improvement and the deepening of ou harbors and channels; and the depth of water in an important harbor like tha of Brunswick, which was ample some years ago, is now inadequate to meet th requirements of ships that can come to the bar to connect with the commerce which can be brought to or taken away from the docks by the rail carrier.

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10. The Federal Government is charged with the duty and responsibility of providing and maintaining adequate channel and harbor facilities to accommodate the needs of water-borne commerce, and unless these channel and harbor facilities are adequate the economic advantages of larger and deeper ships are nullified, and the ports not possessing these facilities can not be utilized to their full extent in fostering and protecting the commerce of that section of the country to which they should be a public asset.

11. There are none too many harbors on the South Atlantic coast susceptible of development to meet the needs of the growing commerce of this section of the country. The ports of harbors are not local institutions or private property and should not be so regarded. They are natural gateways, through which commerce should pass as sand through an hourglass, converging and diverging therefrom. They are an asset belonging to the Nation, and this fact is recognized by the national policy of Government improvement and maintenance. If this were not so, each harbor would have to be developed by local interests and would lose its character as a national asset, and we would not be here to-day arguing with a representative of the Federal Government the necessity for improving this harbor. I hope, therefore, that we may so present this case as to have Col. Langfitt feel that this is not purely a local question, but is, in fact, a national question, involving the improvement and maximum utilization of a facility of commerce which is an asset to the entire country and a particularly valuable asset to that section of the country more immediately affected.

12. In the past the export commerce of the Southeastern States has been confined largely to light and bulky articles, such as cotton, cottonseed products, lumber, naval stores, etc., largely products of the soil and the forest. We are now rapidly developing industrially, producing a heavy tonnage of pig iron, steel rails, bar iron, structural steel, wire and nails, and other manufactures from iron. The manufacture of our cotton in the South now exceeds that of New England, producing a heavy tonnage of cotton fabrics, a large portion of which must seek water transportation. The manufacture of agricultural implements, furniture, and many other articles is increasing so rapidly as to require new markets. The rapid increase in the production of grain in the South leads to the hope that before many years there will be a sufficient surplus of grain and cattle to warrant exportation.

13. At the time of my last talk before you the Panama Canal had not been opened, and we had no experience to guide us in forecasting what would be its effect upon our commerce. Since that time the canal has been opened, and there are now four regular lines of steamships plying between the Atlantic and Pacific coasts. They have developed an extensive traffic, much of which comes from and goes to the Southeastern States. This traffic is growing rapidly. Some of these lines have constructed steamers with a draft of 29 feet. At the present time some of these steamers carry their freight, which has its ultimate destination in the Southeastern States, to eastern ports. It is there transshipped in coastwise vessels of lighter draft to its ultimate destinations to and through the South Atlantic ports. Not one of these lines has yet made a South Atlantic port a port of call for westbound business. One potent reason for this, I am advised, is because they take on the majority of their cargo at eastern ports, which loads them to a greater immersion than will be conveniently accommodated by the South Atlantic ports.

14. Many agencies are working toward the development of our commerce with South American countries. The opening of the Panama Canal has materially improved the prospects for the development of this commerce with the countries on the west coast of South America. This commerce is developing, and we have reason to hope for a very large development in which the South Atlantic ports should play no insignificant part.

15. The development of an export and coastwise commerce to give an outlet to the growing agricultural, and industrial development of the South is closely corelated to the development of our importations, thus creating a balance of trade. The South Atlantic ports already receive large quantities of imported fertilizer materials, jute, coffee, etc., as well as conducting a most extensive coastwise commerce.

16. One of the prime factors in commercial competition is the cost of transportation. In international commerce the cost of transportation is the controlling feature. For the products of manufacture in the South to compete successfully with the products of manufacture in other sections of the country,

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and particularly with the products of manufacture in the world markets, it is essential that they have the advantage of the minimum competitive ocean transportation charges.

17. The light and bulky commodities referred to before will load a ship, even of deep draft, to her full cubic carrying capacity, but not to her immersion limit. This is an economic loss. To secure a minimum cost of transportation on a cargo a vessel must be loaded not only to her maximum cubic capacity, but to her maximum immersion limit. A failure to do this results in an increase in the average cost of transportation, and that port, or that section of the country, together with its commerce, is placed at a disadvantage with ports and sections of the country, and also with foreign countries, where such economic loading can be accomplished. The absence of this deep-water facility places an additional burden not only upon the existing commerce of that portion of the country served by ports which are lacking in deep water, but effectually restricts its commercial growth.

18. The Southern Railway Co. is particularly interested in the development of these south Atlantic ports, and especially interested in the development of the port of Brunswick. Brunswick has admirable rail connections and facilities, being reached by the Southern Railway with 7,036 miles of railroad, the Atlantic Coast Line with 4,714 miles, and the Atlanta, Birmingham & Atlantic with 645 miles. This mileage reaches the entire industrial and agricultural South, either directly or with its immediate connections. In addition to this there are two local lines which serve Brunswick primarily.

The Southern Railway Co. has constructed at Brunswick a most complete warehouse and facility for the handling of bulk fertilizer materials, salt, and other similar commodities. This warehouse is equipped with the most modern mechanical appliances for prompt and economical handling. In addition to this we maintain extensive general water-front terminals.

19. We expect the commerce through Brunswick to grow, but for it to reach its maximum development and be in position to participate in open and free competition it is primarily essential that the channel and harbor be improved and deepened to keep pace with the evolving conditions of transportation, both water and rail, so that the two may meet without obstruction at the water front, and we earnestly recommend and urge a favorable consideration by the Board of Engineers of the project for improving Brunswick's harbor.

EXHIBIT F.

REMARKS OF MR. C. LEE COOK, PRESIDENT, BRUNSWICK CREOSOTING CO.

1. I came here to-night for the purpose of being a good listener. My physician, whom I consulted before I ventured out, forbade that I make a speech. On that condition he consented my attending this meeting, and so I came hoping to escape that obligation.

2. Gentlemen, you have heard Mr. Lamb tell you rather plaintively that he was in the unfortunate category of speaking first, and so would have to think out the program for this very eventful occasion. I want to say that I am equally unfortunate, for the able speeches delivered have left little for me to say.

3. Gentlemen, though Congress is assembled at Washington, and the Members in both Houses are seriously engaged in the endeavor to pass the ship-purchase bill, and though there is some indication that, important as it is, it might not have been consummated by March 4; and though Congress is in short session, and faces the possibility of an extra session to complete legislation now pending, I think, conservatively, that if Congress could have heard to-night's presentation of this subject as we have heard it there would be no question of the appropriation which is necessary for the enlargement of this harbor, and I believe that our distinguished guest of honor, Col. Langfitt, would have been relieved of much of the great task that confronts him in presenting the question to that body.

4. Gentlemen, Brunswick, of course, is to be the center of population that will be the center of benefit if this harbor, which I trust will be, is put upon a standard that will make Brunswick one of the great seaports of America. But, gentlemen, Brunswick does not own the harbor. Brunswick is a child of it. This harbor is one of the resources and one of the facilities of these United States. And though the city of Brunswick should be congratulated for the splendid effort she is making to enlist the attention and intelligent interest of Congress, yet in sending her appeal here to-night, or when it goes before Con-

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gress, she can still have said that she only speaks in part the voice of the entire ountry when she desires that this magnificent harbor be such that it will float afely and at all times the greatest ships that now ply the Atlantic Ocean or he world's highways of commerce.

5. Gentlemen, there was a time when the United States of America could ook out upon the broad blue ocean and see her flag flying at the mastheads of nany ships; she stood as a prime factor of international commerce. This is wonderful country. It has not a parallel on the face of the earth, so far as y history we know. And so, with her wonderful resources and her practical nd beneficent form of government, free to all who would honestly strive to eceive its blessings, she has made a mighty home commerce in the North, East, outh, and West. When in the midst of this great national consciousness the Napoleonic struggles made European countries sick of strife, turning to this ountry, men looked to it as the one haven of peace and prosperity. That happy ondition sent thousands to our wonderful undeveloped sections, so that now here wilderness was there are fields and towns and mighty cities, linked ogether by vast systems of railroads, telegraphs, and telephones, the full devel- ping of which made us to forget for a time the world around us. But, gentle- nen, regardless of a country's bounty and wealth and energy, in the end facility utruns demand, and then readjustments must begin. That readjustment is orcing recognition in the country now. And so you have heard these gentlemen ell to-night that their superiors have been engaged in the task of finding usiness beyond that of internal development. And so this country has come o the place where her facilities, where her wonderful resources surpass her narkets, and she must look beyond her shores. And when in nature could we ave a more favorable time than now? Though we wish to no nation any arm, yet, in the face of a war that has set half of this globe afire are we not o take advantage of what it brings to us? We are not selfish in our wish to erve the world in its distress. 'Tis a great commission, and this country is qual to it. I say that this harbor is needed for the purpose. It is needed for he broad, great policy of this country more than it is needed to bring the highest ossibilities to any specific community.

6. We have to-night the greatest avenues of possible commercial achievements hat the world has ever seen. We have them not from a standpoint of taking rom the world but of serving the world, and, gentlemen, we need our harbors n carrying that into effect.

7. Here is this great South, with its iron mills in Alabama, with its splendid nanufacturing enterprises in Chattanooga and elsewhere, and with broad reas that are about to blossom in more than in cotton. A good harbor is needed o carry the country's overflow to the world.

8. Congress, as I view the question, could not make a wiser appropriation. nd to you, Col. Langfitt, I earnestly urge—not as a citizen of Brunswick but s a Kentuckian—that in your good time and in your good judgment you will eem it to the interest of commerce, to the War Department, to the Navy, and o the country in general to recommend to Congress the said appropriation.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 404.

WESTPORT HARBOR AND SAUGATUCK RIVER, CONN.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON REEXAMINATION OF WESTPORT HARBOR AND SAUGATUCK RIVER, CONN.

DECEMBER 16, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 15, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated July 23, 1915, together with copies of reports from Maj. G. B. Pillsbury, Corps of Engineers, and the Board of Engineers for Rivers and Harbors, dated May 14, 1915, and June 15, 1915, with map, on reexamination of Westport Harbor and Saugatuck River, Conn., made in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, July 23, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Reexamination of Westport Harbor and Saugatuck River, Conn.

1. Under authority contained in section 14 of the river and harbor act approved March 4, 1915, there are submitted herewith for trans-

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mission to Congress report dated May 14, 1915, with map, by Maj. G. B. Pillsbury, Corps of Engineers, and report dated June 15, 1915, by the Board of Engineers for Rivers and Harbors relative to the project for improvement of Westport Harbor and Saugatuck River, Conn.

2. The existing project provides for a channel 4 feet deep and 60 feet wide up to Westport, a distance of about 3½ miles, removal of ledge opposite Stony Point, removal of bowlders from the channel and repairing breakwater at Cedar Point. This project was practically completed in 1896, since which time no dredging has been done in the river, and the upper part of the channel has greatly deteriorated. In a report on survey of this locality, authorized by the act of July 25, 1912, and printed in House Document No. 148, Sixty-third Congress, first session, the unsuitability of the existing project, both as regards economical maintenance and commercial utility, was explained. It was recommended that a new project be adopted providing for the construction of a channel 5½ feet deep and 75 feet wide, at an estimated cost of $21,000 for first construction and $300 annually for maintenance, provided that local interests will excavate and maintain necessary branch channels to the docks. In view of the present conditions at this locality, the district officer now recommends the formal discontinuance of operations under the present project. The division engineer and the Board of Engineers for Rivers and Harbors concur in this recommendation.

3. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore recommend that legislation be enacted authorizing the abandonment of the present project for the improvement of Westport Harbor and Saugatuck River, Conn., attention being called to the project recommended in House Document No. 148, Sixty-third Congress, first session, for the further improvement of this locality.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
June 15, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. This report on Westport Harbor and Saugatuck River, Conn., is submitted under authority of that portion of section 14 of the act of March 4, 1915, which reads:

> And the Chief of Engineers is directed to make a report upon any other projects, river or harbor, the further improvement of which under present conditions is undesirable, or in which modifications of the plans or projects should be made.

2. The existing project provides for a channel 4 feet deep and 60 feet wide up to Westport, a distance of about 3½ miles. The project was practically completed in 1896, since which time no further work has been done and the channel has deteriorated.

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3. The question of the needs of this river and harbor was fully discussed and reported upon under authority of the act of July 25, 1912. The report is printed in House Document No. 148, Sixty-third Congress, first session, and is now before Congress. It makes clear the unsuitability and inadequacy of the present project and recommends a modification so as to provide for a channel 5½ feet deep at mean low water and 75 feet wide, at an estimated cost of $21,000 for first construction and $300 annually for maintenance, provided that no expenditures be made on this work until assurance, satisfactory to the Secretary of War, has been given that the community will excavate and maintain such branch channels to the docks as are necessary for the utilization of the main channel to be excavated by the United States.

4. The district officer finds present conditions practically as then described, and he adheres to the former recommendations and believes, for reasons given, that the existing project should be discontinued as being unsuited to the locality. The division engineer concurs with the district officer.

5. In view of the report recently submitted and now before Congress advocating a change in the present project so as to better meet existing needs, and the fact that the maintenance of the existing project would be comparatively expensive and would not afford the relief desired, the board, in concurrence with the views of the district officer and the division engineer, recommends legislation authorizing either the abandonment of the present project or the adoption of the larger project reported in House Document No. 148, Sixty-third Congress, first session.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

REEXAMINATION OF WESTPORT HARBOR AND SAUGATUCK RIVER, CONN.

UNITED STATES ENGINEER OFFICE,
New London, Conn., May 14, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Project for improvement of Westport Harbor and Saugatuck River, Conn.

1. The following report on the project for the improvement of Westport Harbor and Saugatuck River, Conn., with a view to discontinuing improvement under such project, is submitted in compliance with departmental indorsement of April 30, 1915, pursuant to the provisions of the river and harbor act approved March 4, 1915.

2. The Saugatuck River is a small stream which rises in the towns of Danbury and Ridgefield, in the western part of the State of Connecticut, flows in a southerly direction for about 20 miles, and empties into Long Island Sound at a point about 11 miles to the southwest of the entrance to Bridgeport Harbor. The tidal and navigable

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portion of the river is about 4½ miles in length by the channel and extends from Long Island Sound to the center of the town of Westport. The factories, coal and lumber yards, and dwellings of the town extend down the river as far as the railroad station, which is situated in a part of the town known as Saugatuck, distant about 1¼ miles from the town center. Between Westport and Saugatuck the river is from 200 to 300 feet wide. Below this it expands into a broad, shallow inner bay, through which a narrow but generally deep channel follows a winding course into Long Island Sound.

3. In its natural condition this waterway had a least depth of 5 feet at mean low water up to the railroad bridge at Saugatuck; above this point the available depth diminished gradually until at Westport it was less than 1 foot. The upper portion of the channel was much obstructed by bowlders. The mean range of tide is about 7 feet.

4. The improvement of this river was initiated by the General Government in 1826. The first project comprised the deepening of the channel to Westport, removing obstructing rocks, building a breakwater at Cedar Point, and cutting a canal through Great Marsh, to afford a more direct channel to Long Island Sound. This project was completed in 1840. The breakwater was repaired and extended in 1867 and 1870. The canal through Great Marsh has long been abandoned, and has filled in to such extent as to be no longer of service. The present project was adopted in 1892, and modified in 1896. It provides for a channel 4 feet deep and 60 feet wide to Westport; for removing the ledge opposite Stony Point; for removing bowlders in the channel; and for repairing the breakwater at Cedar Point, all at an estimated cost of $18,000. The 4-foot channel was completed to Westport in 1896, but had some deficiencies in width; the Cedar Point Breakwater was repaired and extended; the ledge opposite Stony Point and a number of bowlders were removed from the channel. The entire completion of the project requires further removal of bowlders and dredging to full project dimensions in the upper portion of the channel, together with repairs to the Cedar Point Breakwater.

5. No dredging has been done in the river since 1896, and the upper portion of the channel has greatly deteriorated. The last survey, made in 1913, showed, indeed, comparatively little shoaling in the main portion of the channel, but the branches at its head, by which the wharves are reached, had become almost obliterated. The river had shoaled slightly below the point where the dredging had been done. At low water, boats of a maximum draft of 5 feet can be taken to Saugatuck, the draft being limited by shoals at the crossing at Judys Point. From Saugatuck to Westport the river is commercially navigable at high tide only. The maximum draft that can now be carried to Westport at high water is about 7½ feet.

6. The navigable portion of the river is crossed by three bridges, the New York, New Haven & Hartford Railroad bridge at Saugatuck, with a rolling lift draw, which provides a horizontal clearance of 57 feet; a highway bridge about 1,200 feet above the railroad bridge, with a swing draw, which provides a horizontal clearance of about 54 feet; and a highway bridge at Westport, with a swing draw, which provides a horizontal clearance of 50 feet.

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7. The commercial statistics of the river for the past 10 years are given in the following tabulation:

Years.	Coal.	Lumber.	Oysters.	Sand and stone.	Building material.	Steamboat freight.	Total.	Receipts.	Shipments.	Valuation.
	Short tons.	*Short tons.*	*Short tons.*	*Short tons.*	*Short tons.*	*Short tons.*	*Short tons.*	*Short tons.*	*Short tons.*	
1905	17,060	1,288	.....	3,360	448	8,960	31,056	25,456	5,600	(1)
1906	15,332	1,288	.....	.....	448	1,096	18,664	18,374	290	(1)
1907	14,198	390	.....	.....	.....	.....	14,588	14,588	.....	$58,302.60
1908	11,504	.....	.....	.....	.....	.....	11,504	11,504	.....	43,655.08
1909	12,873	.....	.....	.....	.....	.....	12,873	12,873	.....	50,609.80
1910	13,034	200	.....	.....	400	.....	13,634	13,634	.....	55,034.50
1911	13,611	.....	.....	.....	400	.....	14,011	14,011	.....	56,076.87
1912	14,590	.....	600	1,000	900	.....	17,090	17,090	.....	97,276.88
1913	12,481	500	.....	.....	940	.....	13,921	13,921	.....	70,510.22
1914	12,982	.....	.....	2,630	200	.....	15,812	15,812	.....	62,849.55
Average....	13,813.5	366.6	.....	699.0	373.6	.....	16,313.2	15,729.3	.....	62,601.98

[1] Not reported.

8. The great falling off in commerce in 1906 is due to the discontinuance of the steamboat that had previously plied between Westport and New York. The boat could operate only on tides, a situation which rendered its schedule so irregular that it was finally decided that the inconvenience outweighed the advantage to freight rates.

9. On account of the shoalness of the channel the existing commerce in bulk freight, principally coal, is subjected to considerably higher water rates than those prevalent in the neighboring harbor of Norwalk. Investigation in 1913 showed that the rates on coal to Westport from New York Harbor points ranged from 50 to 60 cents per ton; while at Norwalk, at the head of the existing 8-foot channel, the rate was 45 cents a ton or less.

10. Reports of examinations and surveys on this waterway are listed as follows:

References to examination or survey reports and maps or plans (including project documents.)

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entire project	.....	.....	.....	.....	[1] 1871	802
Do	Senate	50	Forty-eighth	First	[1] 1884	673
Do.[2]	House[1]	179	Fifty-first	Second	[1] 1891	940
River channel	...do.[1]	114	Fifty-second	...do	[1] 1893	999
Do.[2]	House[3]	67	Fifty-fourth	First	[1] 1896	806
Do.[3]	...do	148	Sixty-third	...do	.....	.....

[1] No maps. [2] Basis of project adopted by Congress. [3] Contains map.

A map of the river is published in the Annual Report of the Chief of Engineers for 1894, page 670.

11. The last and most recent survey of the river, the report on which is contained in House Document No. 148, 63d Congress, 1st session, disclosed the existence of a very considerable amount of rock

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in the river bed. It showed that about one-half mile above the high way bridge a ledge crosses the river at a general elevation of 5.5 fee below mean low water, with projections rising to 4 feet below mean low water. About 800 feet north of this ledge there is a reach of 40 feet of rock bottom, either closely packed bowlders or ledge, at from 5 to 6 feet below mean low water. The remainder of the river botton is of mud, sand, and gravel, known to contain occasional bowlders On account of the ledge rock the channel depth which can be provided by an expenditure at all commensurate with the importance o the waterway is limited to 5½ feet below mean low water. In the report upon the survey the district officer recommended a new project for the improvement to provide a main channel in the river 5½ feet deep at mean low water and 75 feet wide at an estimated cost of $21,000 with $300 per annum for maintenance. The division engineer concurred in the recommendations of the district officer and the Board of Engineers for Rivers and Harbors reported that in its opinion it is advisable for the United States to undertake the construction of a channel 5½ feet deep and 75 feet wide, extending from deep water in Saugatuck River to the point where the present channel branches in the town of Westport, provided, however, that no expenditures be made on this work until assurance satisfactory to the Secretary of War has been given that the community will excavate and maintain such branch channels to the docks as are necessary to the utilization of the main channel excavated by the United States

12. The present report is directed to the consideration of the propriety of discontinuing improvement under the present project, which provides for a channel 4 feet deep at mean low water and 60 feet wide, and as this project was at one time practically completed, the question particularly at issue is whether the channel is worthy of restoration and maintenance. The dredges and scows usually employed in this region can operate only with extreme difficulty and at high cost in water as shoal as that provided by the existing project. In fact, such plant would be afloat only at stages above half tide. The cost of restoring and maintaining the present channel would therefore be extravagantly high. On account of this situation it has not been deemed advisable to execute any maintenance operations for nearly 20 years. As a result the waterway has practically relapsed to its original condition so far as channel depth is concerned. It can scarcely be anticipated that its condition will become much worse than at present for a considerable period of years if its maintenance is definitely discontinued, and such discontinuance will consequently leave the commerce of the waterway under no greater disadvantages than those that it now labors under. The benefits secured by the removal of rocks and bowlders are permanent and will not be affected by a discontinuance of the project.

13. A further point for consideration is that the work necessary for the restoration and maintenance of the existing project is largely in the branch channels from the main channel of the river to the wharves, the excavation of which, if a more comprehensive project is adopted, has been deemed the appropriate function of the community. So far as is known, no willingness has been made manifest by the community to excavate these channels at their own expense. The restoration of the existing project without such cooperation would

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consequently involve the United States in expenditure which, under present conceptions, should more properly be borne by the locality.

14. While continuing, therefore, in my opinion that the improvement of Westport Harbor and Saugatuck River, Conn., under a project more comprehensive than the present project is advisable, provided that the community cooperate by providing channels of access to their wharves, I believe the further improvement of the locality under the present project inadvisable, and I recommend the formal discontinuance of operations under that project.

G. B. PILLSBURY,
Major, Corps of Engineers.

[First indorsement.]

DIVISION ENGINEER, NORTHEAST DIVISION,
New York City, May 17, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. Forwarded.

2. I concur in the views and recommendation of the district engineer officer as contained in paragraph 14 of this report.

FREDERIC V. ABBOT,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors see p. 2.]

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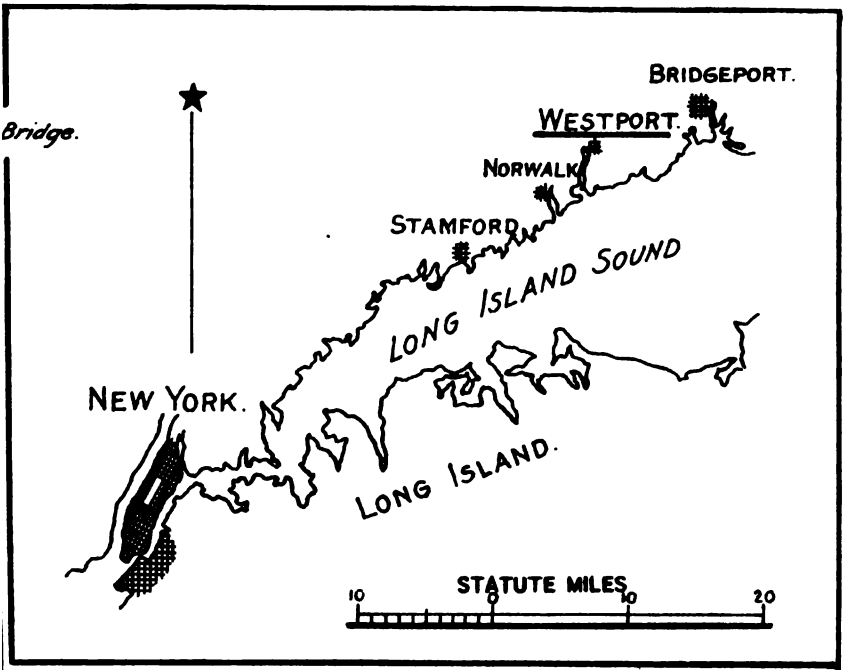

WESTPORT HARBOR AND SAUGATUCK RIVER CONNECTICUT

SCALE OF FEET

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THE MEAN RANGE OF TIDE IS 7 FEET.

ENGINEER OFFICE U. S. ARMY,
NEW LONDON, CONN.,
MAY 14 1915

TO ACCOMPANY REPORT ON THE PROJECT FOR THE IMPROVEMENT OF WESTPORT HARBOR AND SAUGATUCK RIVER, CONN.

MAJOR, CORPS OF ENGINEERS.

House Doc. No. ; 64th Cong., 1st Sess.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 405.

HIWASSEE RIVER, TENN.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON REEXAMINATION OF HIWASSEE RIVER, TENN.

DECEMBER 16, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 15, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated July 20, 1915, together with copies of reports from Maj. H. Burgess, Corps of Engineers, and the Board of Engineers for Rivers and Harbors, dated June 12, 1915, and June 30, 1915, on reexamination of Hiwassee River, Tenn., made in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, July 20, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Report on reexamination of Hiwassee River, Tenn.

1. Under authority contained in section 14 of the river and harbor act approved March 4, 1915, there are submitted herewith for

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transmission to Congress report dated June 12, 1915, by Maj. H. Burgess, Corps of Engineers, and report dated June 30, 1915, by the Board of Engineers for Rivers and Harbors, relative to the project for improvement of Hiwassee River, Tenn.

2. Hiwassee River is a tributary of the Tennessee River, which it enters about 40 miles above Chattanooga. The present project contemplates the development of a channel of not less than 116 feet width and 30 inches mean depth between the mouth of the river and the mouth of the Ocoee River, by use of spur dikes, training walls and submerged sills, bank protection, and dredging, at an estimated cost of $71,125. There has been expended on this project $86,638.64, and on all projects $123,065.71. Work has been confined principally to the 19 miles below Charleston, the head of steamboat navigation, and on this stretch the improvement is practically completed and seems to meet all reasonable requirements of navigation. The commerce is small, and in view of the slight prospects of material increase the district officer recommends that this river be dropped from the list of streams under improvement by the United States, but that occasional snagging be done in connection with work on the upper Tennessee River, under authority of the act of July 25, 1912. The division engineer and the Board of Engineers for Rivers and Harbors concur in this recommendation.

3. After due consideration of the above-mentioned reports I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore recommend that legislation be enacted authorizing the abandonment of the project for improvement of the Hiwassee River, Tenn.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
June 30, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. This report on Hiwassee River, Tenn., is submitted under authority of that portion of section 14 of the act of March 4, 1915, which reads: "And the Chief of Engineers is directed to make a report upon any other projects, river or harbor, the further improvement of which under present conditions is undesirable or in which modifications of the plans or projects should be made."

2. The existing project adopted by the act of June 13, 1902, provides for a channel not less than 116 feet wide and 30 inches deep from the mouth of the river to the mouth of the Ocoee River, a distance of about 35 miles, by the use of spur dikes, training walls and submerged sills, bank protection, and dredging, at an estimated cost of $71,125. There has been expended under this project $86,638.64, and on all projects $123,065.71. Work has been confined principally to the 19 miles below Charleston, the head of steamboat navigation. The improvement is practically completed over

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this reach, and seems to meet all reasonable requirements of navigation.

3. In view of the smallness of the commerce of this stream and of the slight prospects for material increase the district officer recommends that the Hiwassee River be dropped from the list of improvements, but that occasional snagging be done out of funds provided for the maintenance of the upper Tennessee, of which this river is a tributary, under authority of the act of July 25, 1912. The division engineer concurs in the views and recommendations of the district officer.

4. It will be seen from the description of this river that only the lower 19 miles are navigable for even light-draft steamboats, that the project on this reach has been practically completed, and that the commerce is quite small, with little prospect of any material change. It is believed that further improvement, except a small amount of snagging occasionally, as authorized by the act of 1912, is not justified, and therefore the board recommends, in concurrence with the views of the district officer and the division engineer, that legislation be enacted authorizing the abandonment of the project.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

REEXAMINATION OF HIWASSEE RIVER, TENN.

UNITED STATES ENGINEER OFFICE,
Nashville, Tenn., June 12, 1915.

From: The District Engineer Officer, Chattanooga District.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Improvement of Hiwassee River, Tenn.

1. In compliance with the instructions, I have to make the following report on the project for improving the Hiwassee River, Tenn., with a view to its abandonment or modification:

DESCRIPTIVE.

2. The Hiwassee River is formed in Towne County, in northern Georgia, by the junction of several creeks, and flows thence in a general northwesterly direction, passing through the counties of Clay and Cherokee, in western North Carolina, entering Tennessee and crossing or being the boundary between the Tennessee counties of Polk, Bradley, McMinn, and Meigs and joining the Tennessee River 40 miles above Chattanooga. Its drainage area is approximately 2,700 square miles, in which basin there is an ample rainfall fairly well distributed throughout the year, but with, as usual, somewhat greater average in the spring and winter months. It has a number of small tributaries, but the Ocoee is the only tributary of considerable size, and this joins it 35 miles above its mouth, entering from the south.

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3. The upper part of the Hiwassee River is a mountain stream and has never been navigable. Savannah Ford, 41.6 miles from the mouth, has been considered the head of navigation, but even between this point and the mouth of the Ocoee the stream has a steep slope, and it does not radically change its character until after the junction with the Ocoee. Below the Ocoee its slope becomes gentle and the volume of its low-water discharge is sufficient to permit an improvement by regulation. It has been surveyed only from Savannah Ford to the mouth.

4. The fall in the first 6 miles from Savannah Ford down to the pool into which the Ocoee empties is 18.6 feet, or 3.1 feet per mile. This part of the river contains numerous obstructions and is hardly practicable for improvement by open-channel methods. From the mouth of the Ocoee to the mouth of the river the mean fall is about 0.93 foot per mile, and the river has a low-water width varying from about 200 to 400 feet, with an average of about 300 feet. The banks are generally composed of a hard clay or of rock and their height above low water is about 15 feet. The bottom of the river shows rock at the shoals, but the botttom in the pools is generally covered with sand or gravel. There are few islands and no shifting sand bars. Between the Ocoee and the mouth of the Hiwassee there are 21 shoals which before the improvement was undertaken were regarded as obstructions to navigation.

5. The low-water discharge of the Hiwassee River has not been measured, but from observations taken at higher stages it was calculated to be something over 1,200 second-feet.

HISTORICAL.

6. In 1830 the State of Tennessee appropriated money for the improvement of the Hiwassee and again made a further appropriation in 1842. This money was used for the removal of bowlders, rock reefs, and other obstructions from the channel and in the cutting of overhanging trees from the banks. Only a limited amount of work was done, but it is believed that it resulted in giving somewhat greater safety and convenience to navigation and favored the development and settlement of the countries tributary to the river. The total amount expended by the State is not known.

7. The act of Congress dated June 23, 1874, directed an examination or survey of the Hiwassee River below Benton, Tenn., and this examination was made under the direction of Maj. McFarland, Corps of Engineers, by Mr. Maurice Kingsley, assistant engineer, and the report is published in the Annual Report of the Chief of Engineers, Part I, 1875, page 809. The act of Congress mentioned Benton as the upper terminus of the survey, but as Benton is 2 miles from the river and as the real head of navigation was found to be at Savannah Ford, some distance upstream from the Benton landing, the examination began at Savannah Ford. There was recommended an improvement of this stream from Savannah Ford to the mouth for channels 2 feet deep at low water and 40 feet width, and the estimated cost of the work was given at $20,000.

8. The act of August 14, 1876, made the first appropriation for the Hiwassee River, and adopted as the project for improvement that recommended by Maj. McFarland. Upon recommendation of the

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district officer in his annual report for 1878, the estimated cost was increased to $30,000; again, under similar recommendation in 1882, to $34,000, and in 1885 to $36,500.

9. Following the initial appropriation of 1876, each river and harbor act contained an item for the improvement of the Hiwassee River, until the act of September 19, 1890, appropriated the final sum necessary to make up the full amount of the project estimate of $36,500, this act stating the sum named to be for "completing the improvement." All of this total was expended by the end of September, 1892, except $72.93, with the result of "a partial improvement of the lower river, securing an increased depth of channel and removal of surface obstructions and overhanging trees." But the original plan of improvement was far from being completed. Following the practical exhaustion of funds in 1892 no further work was done on the Hiwassee under this old project of improvement, and on June 8, 1896, the Chief of Engineers issued the following instructions to the district officer:

> As no appropriation has been made for continuing the improvement of this river since September 19, 1890, it can properly be assumed that, for the present at least, Congress has abandoned the improvement. The work will therefore be dropped from the list of duties with which you are charged. * * * A brief final report will also be submitted for the current fiscal year.

Following the final report referred to, the Hiwassee River was dropped from the list of streams under improvement by the United States.

10. The act of July 13, 1892, directed a preliminary examination of the Hiwassee River from its junction with the Tennessee to the mouth of the Ocoee, and the report on this examination was made by Lieut. Col. Henry M. Robert, Corps of Engineers, United States Army, who stated that the river was worthy of improvement and that a survey was necessary in order to prepare plans and estimates therefor. (Report is published in Annual Report of the Chief of Engineers for 1893, p. 2412.) No action by Congress was taken on the recommendation for survey until the act of March 3, 1899, which directed that it be made.

11. The survey was made under direction of Maj. Dan C. Kingman, Corps of Engineers, United States Army, who made a preliminary report under date of May 20, 1900, and a final report under date of September 30, 1900. (These reports are printed in the Annual Reports of the Chief of Engineers for 1900, p. 3010, and for 1901, p. 2458.) The survey covered the river up to Savannah Ford, but no plan of improvement for the 6 miles between that point and the mouth of the Ocoee was submitted. Maj. Kingman recommended that the 35 miles below the mouth of the Ocoee be improved by regulation for a low-water depth of 3 feet, with a mean depth through the entire width of the navigable channel of 2½ feet. The channel width was fixed at 164 feet, but a minimum width of 116 feet was allowed for one shoal. The maximum calculated current at low water in the regulated channels was 3.7 feet per second, except for one shoals channel, where it was calculated to be about 5 feet per second. The estimated cost of the improvement was $71,125. The appropriation for the Hiwassee River by the act of June 13, 1902, adopted this plan of improvement, and it constitutes the present project.

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STATUS OF PRESENT PROJECT.

12. In the appropriations beginning with the act of June 13, 1902, the improvement of the Hiwassee has been grouped with the Clinch and the Holston, or with the Clinch only; and from the sum named for the improvements thus combined the Secretary of War has made allotments for the Hiwassee. However, the last appropriation for the Hiwassee, of July 25, 1912, made the appropriation directly for that stream. The total amount appropriated and allotted since the adoption of the present project is $89,782.40. Adding the balance on hand from preceding project the total becomes $89,855.33, of which there has been expended to date $86,638.64, the balance of $3,216.69 being transferred under the terms of the act of March 4, 1915, to other improvements. The expenditures under the old and new projects amount to $123,065.71.

13. The portion of the river below Charleston, where the Southern Railway crosses the stream, being more useful to navigation, all expenditures since 1902 have been applied to the improvement of the shoals in this reach; but under the previous project some work was done between Charleston and the mouth of the Ocoee, and some also, of very minor character, even above the tributary stream. However, the work above Charleston has been more for the purpose of facilitating high-water navigation by the removal of snags and similar obstructions, rather than to the securing of a permanent improvement for light-draft low-water navigation. Confining the bulk of expenditures to the lower 19 miles of the river has resulted in the practical completion of the improvement over that reach, and no work other than maintenance has been done in the past four years on the Hiwassee. At Charleston the fixed bridge of the Southern Railway does not give sufficient clearance for the passage of other than small boats and rafts, and, as the prospect for building up a river traffic above that point has not appeared to be very probable, no effort has been made to require the reconstruction of the bridge, which practically makes Charleston the head of navigation except for rafts and small boats. The improvement below Charleston being completed, and there appearing to be no necessity for continuing such work above that point, nothing seems to be needed at present but the maintenance of the improvement over this 19 miles of river. For such maintenance work, which will consist principally in the removal of snags and similar obstructions, the provision of the river and harbor act of July 25, 1912, permitting the application of funds appropriated for maintenance on the main stream to snagging operations on a navigable tributary, will probably quite meet the needs on the Hiwassee, where an expenditure of about $500 from the appropriation for the upper Tennessee at intervals of three or four years will probably be sufficient to keep the channel free from obstructions of this kind. Should it later be found that the cost of the periodical snagging be more than $500, it would be advisable for the district officer to recommend that the annual allowance of $500 be permitted to accumulate for several years, so as to permit it to be used in a single season; and should Congress agree to such request, there is no doubt that the amount thus made available would be sufficient to keep the Hiwassee free from this class of obstructions.

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COMMERCIAL STATISTICS.

14. Since the resumption of work in 1902 commercial statistics have been collected, and the following table gives the totals for each year since then:

Year.	Forest products.	Farm products.	Merchandise and miscellaneous.	Total.	Rafted.	Total carried by boat or barge.	Passengers.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	
1902	9,444	3,055	2,042	14,541	6,014	8,527	638
1903	7,099	5,713	740	13,552	6,266	7,286	975
1904	1,857	816	330	3,003	1,380	1,623	260
1905	5,878	1,880	3,117	10,875	4,649	6,226	67
1906	1,730	1,138	695	3,563	[1] 1,300	[1] 2,263	200
1907	2,645	3,070	1,325	7,040	[1] 2,400	[1] 4,640	360
1908	3,510	2,346	474	6,330	[1] 3,400	[1] 2,930	124
1909	400	2,160	460	3,020	[1] 200	[1] 2,820	.....
1910	833	1,704	541	3,078	[1] 500	[1] 2,578	.....
1911	1,871	1,539	307	3,717	971	2,746	.....
1912	1,831	1,808	473	4,112	458	3,654	.....
1913	1,699	720	220	2,639	399	2,240	.....
1914	1,208	436	698	2,342	570	1,772	1,226

[1] Estimated; reports not complete.

15. The tonnage carried by boat and barge is moved only over the reach below Charleston, while the rafted timber products come from points higher upstream. It may be noted from the table that there has been a slight reduction in the amount of the commerce in the 12 years, and that the total freight movement on the stream is small. Unless there be provided a navigable depth sufficient for barge traffic, and unless such improvement cover much more of the river than the 19 miles at its lower end, it seems improbable that there will be any considerable increase in the river traffic, and such an improvement can be effected only by canalization. The canalization of a stream like the Hiwassee is quite an expensive undertaking, and, with no better prospects for the development by such an improvement of a considerable commerce, it is clear that it is not advisable for present undertaking. Nor does there seem to be any prospective development in river traffic which would justify the United States in completing the present project by extending the improvement between Charleston and the mouth of the Ocoee, as originally contemplated. The improvement below Charleston having practically been completed, and there being in existence some small traffic on the river, it would seem to be justifiable to maintain the improvement, at least to the extent of the removal of snags and similar obstructions.

POWER DEVELOPMENT.

16. The Ocoee, the principal branch of the Hiwassee, has already been utilized for power development by the East Tennessee Power Co., apparently without the authority of the United States. While antecedent authority should have been obtained before the power structures were built, it is not believed that the United States should interfere with these works. If in the future it becomes advisable for the United States to supervise the operation of the power plants in the interest of navigation on the streams to which the Ocoee is tributary, or to require installation of locks (at the expense of the

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power company or of the United States) at the power dams, in order to make this stream available for purposes of navigation, it is believed that ample authority exists for such action.

17. The upper portion of the Hiwassee has a steep slope, and it is quite likely that power companies will desire to utilize the potential power of the stream. It is believed that such power developments should be encouraged, and that the only provisos for navigation which need be made are to have the power dams arranged for the possible future construction of locks and for the United States to retain the right to construct such locks when it desires to do so and to regulate the pools in the interest of navigation. The development of power on the Hiwassee below the mouth of the Ocoee is not likely to be proposed, except possibly in connection with the construction of locks and dams if the canalization of the stream be undertaken; but, should this method of improving the stream be considered in the future, the possibility of an economical combination between power development and navigation improvement should carefully be investigated. At present it is not to be questioned that the development of power can not be so combined with the improvement for navigation as to make the canalization of this stream advisable from the standpoint of economy.

DRAINAGE AND TERMINALS.

18. There are no questions of drainage which need be considered in connection with the improvement of this stream. There are no terminals located on the banks other than mere cleared and graded banks. In fact, it is believed that Charleston is the only place where even the minor improvement of grading the banks can be found. Elsewhere merely clearings on the banks suffice.

RECOMMENDATION.

19. In view of the smallness of the commerce on this stream, and of the slight prospects for material increase therein, it is recommended that the Hiwassee River be dropped from the list of the streams under improvement by the United States, but that occasional snagging be done out of funds provided for maintaining the improvement of the upper Tennessee River, upon recommendation of the Chief of Engineers and approval of the Secretary of War under the provisions of the act of July 25, 1912.

H. BURGESS,
Major, Corps of Engineers.

[First indorsement.]

OFFICE DIVISION ENGINEER, CENTRAL DIVISION,
June 17, 1915.

To CHIEF OF ENGINEERS:

I concur in the views and recommendation of the district officer.

H. JERVEY,
Lieut. Col., Corps of Engineers,
Division Engineer.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 406.

PLATTSBURG HARBOR AND VICINITY, LAKE CHAMPLAIN, N. Y.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF PLATTSBURG HARBOR AND VICINITY, ON LAKE CHAMPLAIN, FOR A DEEP-WATER CONNECTION WITH SUITABLE TERMINALS THAT ARE TO BE ESTABLISHED AT PLATTSBURG, N. Y., IN CONNECTION WITH THE NEW YORK STATE BARGE CANAL.

DECEMBER 16, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 15, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated August 19, 1915, together with copy of a report from Col. W. M. Black, Corps of Engineers, dated June 5, 1915, with map, on preliminary examination of Plattsburg Harbor, N. Y., made by him in compliance with the provisions of the river and harbor act approved March 4, 1913.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

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WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, August 19, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Plattsburg Harbor, N. Y.

1. There is submitted herewith, for transmission to Congress, report dated June 5, 1915, with map, by Col. W. M. Black, Corps of Engineers, on preliminary examination called for by the following item contained in the river and harbor act approved March 4, 1913:

Plattsburg Harbor and vicinity, on Lake Champlain, for a deep-water connection with suitable terminals that are to be established at Plattsburg, N. Y., in connection with the New York State Barge Canal.

2. The harbor of Plattsburg is located on the westerly shore of Cumberland Bay, Lake Champlain. It is protected by a breakwater constructed by the United States. As modified from time to time, the project now provides for a breakwater 1,565 feet long, and for dredging to a depth of 9 feet at low lake level between the breakwater and the wharves. The State of New York has constructed a barge-canal terminal, costing $160,000, and has also provided a deep-water connection in the form of a channel 150 feet wide and 12 feet deep at mean lake level. The facilities already provided by the State and Federal Governments are deemed adequate, and the district officer, who is also the division engineer, believes that additional Federal improvements are not warranted.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated July 13, 1915, concurring in the unfavorable views of the district officer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Plattsburg Harbor and vicinity on Lake Champlain, for a deep-water connection with suitable terminals that are to be established at Plattsburg, N. Y., in connection with the New York State Barge Canal, is not deemed advisable to a greater extent than authorized by the existing project.

DAN C. KINGMAN,
Chief of Engineers United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Second indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
July 13, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's report of preliminary examination of Plattsburg Harbor and vicinity, on Lake

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Champlain, for a deep-water connection with suitable terminals that are to be established at Plattsburg, N. Y., in connection with the New York State Barge Canal, called for by the act of March 4, 1913.

2. Plattsburg Harbor is located on the westerly shore of Lake Champlain. Saranac River, a small stream about 42 miles in length, empties into the harbor.

3. The existing United States project provides for a breakwater 1,565 feet long, and for dredging to a depth of 9 feet at low lake level between the breakwater and wharves. The project is completed. The total expenditure has been about $212,000.

4. The recently built State barge canal terminal is located about 1 mile north of the mouth of Saranac River. It consists of a pier 400 feet long and 200 feet wide, protected by a breakwater 700 feet long and a channel of approach 150 feet wide and 12 feet deep. These improvements cost about $160,000.

5. At present the commerce is handled principally by rail, the water-borne tonnage amounting to only about 6,000 to 7,000 tons of miscellaneous merchandise. It is expected that traffic will increase with the opening of the enlarged canal, especially in connection with the development of the iron-ore district tributary to this port. In 1913 the lake steamers carried 125,972 passengers to and from Plattsburg. The district officer, who is also the division engineer, has reached the conclusion that the facilities afforded by the State and Federal Governments are adequate to a growth of a considerable water-borne commerce, and that until the existing facilities are fully utilized no additional improvement is warranted.

6. Notice of the unfavorable report was sent to interested parties, and in response thereto the board has received a communication from the Plattsburg Chamber of Commerce, setting forth its views regarding the needs of further improvement, and one from the Board of Public Works of Plattsburg approving the above. These have received consideration.

7. The improvements already made by the United States and the State at considerable cost appear ample for the present commerce, and for that which may be expected in the near future, and until these facilities have been found from experience to be inadequate it is believed that additional improvement will not be justified. The board therefore reports, in concurrence with the views of the district officer, that at this time it is not advisable for the United States to undertake any further improvement at Plattsburg Harbor, N. Y., and vicinity.

8. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other related subjects which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

For the board.

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

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PRELIMINARY EXAMINATION OF PLATTSBURG HARBOR, N. Y.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
First District, New York City, June 5, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Report on preliminary examination of Plattsburg Harbor, N. Y.

1. In compliance with instructions, the following report is submitted on the examination and inspection of Plattsburg Harbor and vicinity, on Lake Champlain, for deep-water connection with suitable terminals that are to be established at Plattsburg, N. Y., in connection with the New York State Barge Canal, ordered by the river and harbor act approved March 4, 1913.

2. In response to the petition of residents of the Plattsburg district that the language of Congress be not interpreted so as to restrict the examination to the advisability solely of a connection between the barge-canal terminal and deep water of Lake Champlain, the Chief of Engineers authorized that the examination embrace any improvements contemplated or proposed for the harbor of Plattsburg, including the mouth of the Saranac River, and the examination was conducted accordingly.

3. Inspections and examinations of the locality were conducted by Capt. R. D. Black, Corps of Engineers, United States Army; by Maj. M. J. McDonough, Corps of Engineers, United States Army, and Mr. A. C. Harper, assistant engineer. They consisted of a number of personal inspections of the locality, and the collection, by interview and correspondence with local interests, of all pertinent information obtainable within the time and with the facilities at the disposal of this office.

4. *General.*—The harbor of Plattsburg, N. Y., is located on the westerly shore of Cumberland Bay, about 30 miles southerly from the northern end of Lake Champlain and the international boundary near Rouses Point, N. Y. Cumberland Bay opens toward the southeast, and Plattsburg Harbor, in its original condition an open roadstead, was without protection against wind and sea from the south and southeast.

5. *Saranac River.*—The Saranac River, which rises in the Adirondack Mountains about 42 miles southwest of Plattsburg, empties into the Cumberland Bay, Lake Champlain, immediately north of and adjacent to the northerly wharf in the Plattsburg Harbor. At the crossing of the Delaware & Hudson Railroad bridge it originally divided into two branches, one passing to the north and one to the south of an island located between the two outlets. The south branch has since been practically eliminated by river deposits and artificial filling. The north or main outlet is very shallow, with a bottom of cobbles and small bowlders. The portion of the mainland near the mouth of the north branch is somewhat distant from the business part of the town. The mouth itself is separated from deep water in the lake by a bar nearly a half mile in width and averaging about 2 feet in depth. The river forms no part of the present harbor. The island formed by the two branches of the river has an elevation from

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to 3 feet above low water, and much of it is submerged to a depth of ver 3 feet at high stages of the lake level. The island consists of iver detritus brought down by freshets, of sawdust, and of ashes om adjoining factories and the village.

6. *Plattsburg Harbor.*—The harbor, which is wholly artificial, is rotected by a breakwater, built and maintained by the Federal Gov- rnment, sheltering three wharves, which project into Cumberland ay to the south side of the mouth of the south branch of the river. t is about 1,500 feet long, varies in width from about 500 feet to bout 1,400 feet, and contains approximately 25 acres. The available epth varies from 9 feet at the wharves to a maximum of about 17 et within the area protected by the breakwater. The wharves are bout one-quarter of a mile from the business center of Plattsburg.

7. *Barge-canal terminal.*—The terminal constructed at Plattsburg y the State of New York, located about 1 mile north of the mouth f the Saranac River, consists of a pier 400 feet long and 200 feet ide, with a breakwater 700 feet long and 100 feet wide, located 250 et to the south of the pier. The slip between the breakwater and e pier and that on the north side of the pier are approached by a hannel 150 feet wide and 12 feet deep, mean lake level, from deep ater. The business center of Plattsburg is about 1 mile from the arge-canal terminal. The State improvements cost about $160,000.

8. *Commercial.*—The present methods of handling freight in the arbor are antiquated and of very low efficiency. The amount of ater-borne traffic at the port is small in comparison with the amount eported to the custom district of which Plattsburg was a port of ntry, but it seems destined for a large increase in the future, due to e opening of the New York State Barge Canal and the development f the rich Adirondack iron ore beds, for which this port will be the oint of shipment. The new State terminal should provide adequate nd efficient means for handling the general merchandise. Platts- urg is on the route of an improved continuous waterway from New ork City to the St. Lawrence River via the Hudson River; the New ork State Barge Canal, Champlain division; the Narrows of Lake hamplain, Lake Champlain, the Richelieu River, and the Chambly anal. The Erie division of the barge canal connects with the Great akes at Buffalo and with the Hudson at Waterford, N. Y.

9. In the reports to the Chief of Engineers previous to 1912 the onnage credited to Plattsburg is believed to include the clearances f the local customhouse district, which includes Rouses Point.

10. Plattsburg is a city of some 12,000 people. The principal anufactures are automobile parts, shirts, paper, excelsior, and mber. The adjacent territory contributes iron ore, granite, raphite, sulphite, and farm products. Plattsburg is a distributing oint for adjacent territory. Besides the population, as quoted bove, Plattsburg Barracks, on the outskirts of the town, has a gar- ison of approximately 1,000 troops. The Catholic summer school nd local hotels add to the population from 1,000 to 2,000 people uring the summer season. It also is a transfer point for thousands f excursionists to the Adirondack Mountains via Chateaugay and usable branches of the Delaware & Hudson Railroad and the lake teamboat lines.

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11. Statistics of manufacturers for the year 1909, as reported in Federal census of 1910, credit Plattsburg with manufacturing establishments employing about 1,243 hands, capitalized at $2,694,000, paying annual wages and salaries of about $671,000, and producing annually merchandise to the value of about $3,138,000. The number of persons employed in the industries of Plattsburg, N. Y., as reported in the Industrial Directory of the State of New York, 1913, recently published, is 1,324, and the principal manufactories reported therein are the Lozier Automobile Co., with about 378 employees; the A. P. W. Paper Co., manufacturers of toilet paper, 36 employees; Bluff Point Stone Co., 36 employees; C. H. Carroll & Co., excelsior manufacturers, 19 employees; Lake Champlain Pulp & Paper Co., 45 employees; Plattsburg Lumber Co., 41 employees; the Plattsburg Shirt Co., 117 employees; the Progressive Pulp & Paper Co., makers of pulp, paper, and wall paper, 94 employees; and the United Shirt & Collar Co., 149 employees. Besides these there are 32 small factories. Incidental to these industries there is a yearly arrival of about 12,000 tons of freight, consisting of pulp, sulphite, coal, etc.

12. The Lake Champlain Pulp & Paper Co. manufacture about 3,000 tons of light tissue paper per year. The ratio is about 4 tons of raw material to 1 ton of finished product, 2 tons of pulp and one-half ton of coal (according to the kind of paper) for every ton of paper produced. The wood used by this company comes chiefly from Canada, and most of the sulphite used in the paper manufacturing comes from Ausable Forks, which is located about 24 miles from Plattsburg. At present a small percentage of the sulphite is imported from Sweden, the Swedish sulphite being superior to the local product. The rail rates for sulphite are at present $3 per ton from New York, N. Y. Water rates by the future water route are computed at about $1 per ton from New York, N. Y. Rail rates on pulp, which is the prevailing way of shipping from Canada, are from 8 to 12 cents per hundredweight, or from $3 to $4.50 per cord (4,000 pounds equal a cord). The Saranac Pulp & Paper Co., situated about 4 miles up the Saranac River from Plattsburg, ships about 12,500 tons of paper and imports about 10,000 tons of raw material per annum. Most of their wood comes from the Adirondacks. It is reported that the International Paper Co., which is situated several miles up the Saranac, at High Falls, which has a fall of 250 feet in about a quarter of a mile, would establish a lake-shore plant if proper water transportation were available, utilizing present water power to generate electricity to operate plant on lake front.

13. The anthracite coal used in the Plattsburg district is received by rail over the Delaware & Hudson Railroad. The coal is a Delaware & Hudson product, and that company controls the local market for such coal. The freight rate from the mine is $1.75 per ton. Bituminous coal delivered at Plattsburg by rail sells at $4.10 per ton. The freight rate is $2.75 per ton, and the cost of the coal at the mines is $1.35. This is not a Delaware & Hudson product.

14. The excelsior manufacturers ship from 8 to 10 carloads a week to New York and vicinity; 10 to 12 tons constitute a carload. The rail rate is 15 cents per hundredweight.

15. The Chateaugay Ore & Iron Co., a Delaware & Hudson holding, built a dock about 800 feet south of the south end of the Federal

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breakwater for loading ore for shipment south on canal boats. The railroad connected with the dock. This form of shipment appears not to have been profitable, as it has not been in use for some 15 years. Ore is now smelted at the mines and shipped by rail in pigs. At the original opening of the mine the product ran as high as 1,500 tons daily, but it is somewhat less to-day. Witherbee, Sherman & Co., the present operators of the ore mines at Port Henry, N. Y., own the large tracts of undeveloped ore lands in the Adirondacks in the vicinity of Plattsburg. Considerable money has been spent on prospecting, and it is probable that these regions will be developed as soon as a profitable market can be secured, which depends greatly on a cheap means of transportation.

16. The territory which depends on Lake Champlain for all transportation other than coal includes the lake ports and the farming country for which these ports are centers of distribution and collection. The total estimated population of the country surrounding the lake, as shown by census of 1910, is 305,900. No attempt is made to estimate the population in the sphere of influence of the connecting waterways to the north and south or of the through business using the lake, but not originating or destined for its ports.

17. *History of the improvement.*—The original project for the improvement of Plattsburg Harbor was adopted by the act of July 4, 1836, and included the construction of a breakwater and pier to protect the wharves from southerly and easterly storms. The breakwater was located at a distance of from 600 to 1,200 feet from the wharves, and between 1836 and 1866 it was built to a length of 844 feet. In 1870, as a result of an examination made during the same year, the project was modified to include the extension of the breakwater 400 feet in a northerly direction and the dredging of shoal. This work was accomplished between 1871 and 1875. The project approved by the act of September 19, 1890, provided for a further extension of the breakwater 300 feet and for replacing the timber superstructure with stone at an estimated cost of $32,500. The river and harbor act of June 25, 1910, appropriated $25,500, the full amount of the estimated cost of completing the existing project in accordance with report printed in House Document No. 759, Sixty-first Congress, second session, by dredging to the depth of 9 feet, low lake level, the shoals between the breakwater and the wharves, redredging the channel in front of the wharves, and repairing the breakwater, including rebuilding of the superstructure of the timber piers with stone. This work was completed in 1914. The completed breakwater as it now stands has a length of 1,565 feet.

18. *Need of improvement.*—The railroad has now nearly a monopoly of the transportation business to the Plattsburg district, and secured it when railroad transportation became superior to the old system of water transportation. The New York State Barge Canal is expected to develop a barge of from 500 to 3,000 tons capacity, and it is expected that one or probably more types will become standard for inland waters of New York State. With this new form of transportation it is believed that water carriers will be able to compete successfully with the present rail transportation. Whether the business centering here would increase sufficiently to justify further expenditures for the improvement of the harbor is believed to depend a

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great deal on the initiative and resourcefulness of the community and the natural resources of the territory. There seems no doubt that the opening of the Champlain Canal will result in the early elimination of the existing type of water craft and the substitution therefor of more economic carriers, with an attendant reduction in insurance charges, a lowering in through rates, and the institution of effective competition. Just what proportion of this benefit can be credited to Plattsburg is problematical.

19. Suggestion has been made that the United States extend the breakwater northward, so as to protect the new channel leading to the barge-canal terminal. Such an extension would have to be about 2,500 feet long, and the expense would be exceedingly great. It is believed that at this time the necessity for such extension is not established and that the expense is not warranted.

20. Suggestion has also been made that the island at the mouth of the Saranac River be built up by spoil from harbor dredging. It is believed that such reclamation of the island, which would be very expensive, would be without material benefit to Plattsburg commerce.

21. *Wharves or terminal facilities.*—The wharves protected by the breakwater consist of three piers, constructed of timber bulkheads filled with earth; basins are formed between them. The north pier has been abandoned as a landing place by boats, principally because of inadequate protection afforded by the breakwater from southeast storms. The remainder of the water front has a depth at the piers and in the basins of about 9 feet at low lake level, the same depth that is provided in the improved channel leading to the wharves. The above wharves are owned by the Dock & Coal Co., of Plattsburg, N. Y., but the center pier is leased to the Champlain Transportation Co., a subsidiary of the Delaware & Hudson Railroad Co., which operates a line of steamers carrying general merchandise and passenger traffic on Lake Champlain. At the piers are landed annually about 5,500 tons of general merchandise, valued at about $530,000, transfer being made by hand trucks. There is a freight storage shed on the pier, and the average wharfage charge is 4 cents per hundredweight for landing and storage. At the south pier and in the basin about 700 tons of lumber are landed, valued at $18,000, the cost of wharfage being a matter of mutual agreement between shipper and dock owner. This lumber is not delivered for consumption at Plattsburg, but the greater part is reshipped after having been dressed at a mill adjacent to the wharf. The docks are supposed to be open to the use of all water carriers on equal terms. There are no public wharves in harbor proper of Plattsburg.

22. *Conclusion.*—(*a*) Plattsburg is an important city by reason of its manufactures, its rail connections, its distributing function, and its function as the outlet of a rich farming district. It is probably destined to be the center of a great iron ore district. It has been given by the State a $160,000 barge-canal terminal, which should be adequate in size for the public business for many years to come.

(*b*) The need for a deep-water connection between the barge-canal terminal and deep water of Lake Champlain has been fulfilled by the construction on the part of New York State of a channel 150 feet wide and 12 feet deep at mean lake level.

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(*c*) The harbor facilities already provided by the State and the Federal Governments are adequate to the growth of a considerable water-borne commerce. Until the commerce develops to the extent of utilizing the facilities thus provided, it is recommended that additional Federal improvements in the locality are not warranted.

(*d*) There are no questions of terminal facility, water power, or other related subjects which could be coordinated with the suggested improvement in such a manner as to render the work advisable in the interest of commerce and navigation.

W. M. BLACK,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors see p. 2.]

LETTER OF PLATTSBURG CHAMBER OF COMMERCE.

PLATTSBURG, N. Y., *June 24, 1915.*

GENTLEMEN: A communication dated June 7, 1915, from Col. W. M. Black, Corps of Engineers, United States Army, advises that the report submitted in regard to the preliminary examination of Plattsburg Harbor and vicinity is adverse and unfavorable to the proposed improvement for the reason that "the existing harbor facilities are adequate for the accommodation of the present and immediately prospective commerce."

As representing undoubtedly the large majority of all interested parties to whom, Col. Black also advises us, the privilege is very kindly extended of making appeal from this conclusion to your board, this association has the honor respectfully to submit for your consideration the following:

1. That judgment as to the advantages and desirability of improving Plattsburg Harbor and the benefits accruing therefrom to the people of this community and to the people of northern New York can not fairly be reached solely upon the basis of present and prospective commerce with the city of Plattsburg alone.

2. That, it being the desire of your board to "present for the consideration of Congress the nearest practicable approach to that project which if financed directly by all of the individuals affected directly or indirectly by the commerce of Plattsburg Harbor would insure to them the maximum ultimate net pecuniary return on the investment" (letter of Capt. R. D. Black, Corps of Engineers, U. S. A., dated June 18, 1914), a full consideration of the merits of the petition from the people of this community for national aid in the improvement of Plattsburg Harbor may include not only a consideration of present and immediately prospective commerce with the city of Plattsburg and with the whole northern section of the State of New York, but, besides including the project of improving "Plattsburg Harbor and vicinity, on Lake Champlain, for a deep-water connection with suitable terminals that are to be established at Plattsburg, N. Y., in connection with the New York State Barge Canal" (act of Congress ordering preliminary examination), such full consideration of the subject may be extended and construed, in accordance with the wish of the people of this community expressed through their Representative, the late Congressman E. A. Merritt, so as to include also a consideration of any project embracing "any improvements contemplated or proposed for the harbor of Plattsburg, including the mouth of the Saranac River." (Letter of Capt. R. D. Black, Corps of Engineers, U. S. A., quoting instructions from the Chief of Engineers, and dated Nov. 24, 1913.)

Upon these two points our appeal is based.

As to the first:

The State of New York has spent $125.000 in the construction of a terminal dock alone on the shore of Cumberland Bay, Plattsburg Harbor, which forms the northern terminus of the State barge canal system. At the present time this dock is in condition to be used, but it serves no purpose, inasmuch as what is known as the "narrows" of Lake Champlain will not admit of the passage of the larger boats for which the canal was designed and for the use of which

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the terminal dock at Plattsburg was constructed. The work of widening and deepening the "narrows" is now being carried on by the State, and will be completed at some time in the near future. But even with this work completed, the Plattsburg terminal dock will still not be freely approachable by these larger boats drawing, when heavily laden, as much as 10 and 12 feet of water; this for the reason that Plattsburg Harbor is not of sufficient depth, and the maintenance of an adequate suitable "channel" permanently is impossible under existing conditions, the explanation of which is as follows:

The bottom of the lake, in Plattsburg Harbor and vicinity, as shown by marine charts of the region for the last 50 years or more, is fine gray sand. The delta at the mouth of the Saranac River, emptying into the lake at Plattsburg Harbor and at a point not quite but almost midway between the private docks owned by the Dock & Coal Co. on the south and the new barge-canal terminal on the north, is a formation which is undoubtedly the result of deposits of sand, silt, and débris of many centuries; but the fact that this delta is now known by the people of this vicinity as "the island," and consists of about 25 acres of land, will serve as a basis upon which to form a judgment as to the amount of material that has been, and is still being, deposited in this vicinity and thrown out into the harbor, especially in the spring at the time of the freshets. This, combined with the powerful action of the water upon the loose, sandy bottom referred to, particularly when stiff southern winds prevail, which are of frequent occurrence, makes the condition of the bottom of the harbor precarious and makes the maintenance of a permanent channel practically impossible. It was clearly the intention of the people of this community to convey, through their Representative, the late Congressman E. A. Merritt, their desire for the removal of this condition; and it was clearly the earnest desire of Mr. Merritt to so convey that expression of their desire, for this desire was based very largely upon the recommendation contained in a letter, dated June 21, 1912, from J. A. O'Connor, terminal engineer, State of New York department of State engineer and surveyor, barge-canal terminals, which is expressed thus:

"I would earnestly recommend that you get your Congressman busy at once, so that Congress will direct in the next river and harbor act a preliminary investigation and examination of the harbor of Plattsburg, with a particular view of excavating the mouth of the Saranac River and channel to the barge-canal terminal."

A paragraph was included in the river and harbor act approved March 4, 1913, providing for a preliminary examination of the harbor and vicinity; but the exact wording of the paragraph did not fully cover the matter and under date of November 21, 1913, the Chief of Engineers, United States Army, upon representations being made to him to that effect, extended the scope of the preliminary examination to include any improvements in connection with Plattsburg Harbor, express mention being made in his instructions of the mouth of the Saranac River.

Upon this basis, and in considering the adequacy of existing harbor facilities, under this broader interpretation of the meaning of the act of March 4, 1913, the fullest possible consideration should be given, not only to present and immediately prospective commerce of the city of Plattsburg alone, but as well to present and prospective commerce of the whole northern section of the State of New York of which Plattsburg, at the northern terminus of the New York State Barge Canal system, is the natural center.

(a) As to the city of Plattsburg alone, it has been impossible in the short space of time that has elapsed since the receipt of Col. Black's communication of June 7, 1915, to secure reliable data covering shipments of freight to and from Plattsburg for the past year; but reliable figures at hand show that the boats of the Champlain Transportation Co. alone carried from Plattsburg to Lake Champlain ports during the summer of 1913 a total of 3,485 tons, and the same boats brought to Plattsburg from Lake Champlain ports during the same period 1,832 tons. This does not include freight carried to and from Plattsburg by the small canal barges and other craft plying between Plattsburg and other lake ports, Whitehall and points to the south, figures in regard to which it is practically impossible to obtain. In regard to shipments by rail information available at this time is still more meager, showing during May and June, 1914, an average daily shipment to Plattsburg of from 10 to 15 tons; but this is only from New York City. Rail shipments from Boston during the same period (May and June, 1914) average 3 to 5 tons. On shipments from other points we have no information at this time; and it should be noted that these are only

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shipments into Plattsburg from Boston and New York City, via what are known as the regular "Plattsburg" cars, daily from New York and twice each week from Boston.

(*b*) As to the commerce of Clinton County and northern New York that moves through Plattsburg by rail and over the docks, or that might in the future so move, statistics would be conjecture and approximations, and, therefore, not reliable, but for your consideration the following will possibly be relevant:

Potatoes.—Clinton County and this whole northern section bear a fine reputation both for quality and for steady, large yield. The yearly average of shipments from this section through Plattsburg alone runs from 2,000 to 2,500 carloads. With the harbor facilities adequate for the full use of the large barge-canal boats and the new dock, the possibilities for infinitely increasing shipments through this port would be enormous, to the immense advantage no doubt of the producers and shippers.

Apples.—The farmers are only just beginning to realize the rich possibilities of this northern section as an apple-growing country. More and more trees are being set out each year. Last year Chicago dealers paid the additional freight and took our apples in preference to those grown in the western part of this State and other places nearer to Chicago. In the past, shipments of this crop in a good season have run as high as 100,000 barrels, and in what is known as a bad season as high as 60,000 barrels. Please note that these figures are accurate. Each year will see large increases, and adequate barge and harbor facilities would further add to it.

Lumber and pulp.—White birch abounds throughout this northern section; pine and poplar, from which pulp is made, are abundant. Lower transportation rates, which would come as the natural result of the free use of the barge canal, made possible for this section by adequate harbor facilities, would make possible enormous shipments of lumber and pulp wood which are not now shipped, because to do so would be unprofitable at present rates and under present lack of adequate docking privileges.

Iron ore.—This whole northern section is rich in iron ore of the finest quality, but at present shipments by rail are attended by prohibitive transportation rates. This is not intended as a complaint against any railroad company; it is merely a statement of fact in regard to existing conditions. Rich iron ore mines have been abandoned at various points in this section, notably Arnold Hill, Palmer Hill, Ausable Forks, Dannemora, and practically so at Lyon Mountain. Adequate harbor facilities and the attendant full use of the barge canal and the terminal dock at Plattsburg would open up this branch of our natural resources which has been, as already stated, practically abandoned.

Miscellaneous.—As a natural consequence of low transportation rates via boat from Plattsburg south and to this point from the south a large volume of miscellaneous commerce which now moves via rail direct from points in northern New York might be expected to move via the cheaper water route, which would further add not only to the advantage of the northern section of the State, but the very fact that there is a large volume of shipments would tend still further to reduce transportation rates, which in turn would work again to further increased shipments.

As to the second.

A sundry civil bill recently passed by Congress contains an appropriation of $125,000 toward a memorial by the State of New York in commemoration of the victory of Commodore Thomas Macdonough on Lake Champlain in September, 1814. At about the same time, or somewhat previously, the Legislature of the State of New York had appropriated a similar amount ($125,000) to be expended in a celebration of the one hundredth anniversary of Commodore Macdonough's victory, to be held at Plattsburg, and which was held in the fall of 1914, and in the construction of a suitable memorial of that victory. Of the latter amount approximately $65,000 remains, after meeting the expenses of the celebration referred to, for the permanent memorial. The district engineer office for this district has charge of the construction of the memorial on behalf of the Federal Government and the Plattsburg Centenary Commission on behalf of the State of New York.

The city of Plattsburg, by the generous bequest of the late Loyal L. Smith, is to receive $200,000, to be expended in the construction of a city hall upon condition that the city of Plattsburg provide a suitable site for such a building. This fund is now at the disposal of the executors of the Smith estate and will

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be transferred to the city of Plattsburg upon compliance with the condition referred to as to the provision of a site.

It is highly desirable that the memorial or memorials referred to and the city hall be collated and combined in such a way as to form a city hall, civic center, and public park; and the city has the greatest confidence that such an arrangement will be effected. Col. Black and Maj. Macdonough, Engineer Corps, United States Army, and the Plattsburg Centenary Commission have been carrying on certain investigations and examinations as to suitable memorial sites with this plan in view, and it is hoped that the site finally determined upon will be that known as the "river street" site, located at the mouth of the Saranac River, immediately overlooking the scene of Commodore Macdonough's great victory, and with the monument erected to the memory of Samuel de Champlain, discoverer of Lake Champlain, in the immediate foreground.

Inclosed and attached herewith you will find photograph [1] showing the mouth of the Saranac River, the "island" (delta referred to above), the proposed site for the memorial and city hall, and the Champlain Monument. The barge-canal terminal dock lies to the right as you look at the picture, about three-eighths of a mile from the Champlain Monument, and the private docks owned by the dock and coal company to the left as you look at the picture, about three-eighths of a mile from the Champlain Monument. The water in the foreground of the picture (taken about 500 feet from the monument) is not navigable by the larger craft now plying the lake and drawing from 3 to 6 or 7 feet of water.

Should the plan outlined above materialize, as it is almost certain to do, and as will be known definitely within a very few days, the Saranac River on the side of the "island" toward the monument (north) and on the other side (south) will probably be dredged and deepened from a point about in front of the monument back as far as the memorial and city-hall site (500 to 600 feet in length), the dredged material being deposited on the "island" and the latter transformed into a park and given the protection of a sea wall. Here also dredged material from the harbor may be deposited.

Upon this, i. e., these contemplated improvements, and upon the unfavorable existing conditions with respect to the consistency of the bottom of the harbor and with respect to river borne detritus, etc., is based the representation of the people of this community that the matter of providing adequate harbor facilities for the future commercial activities of this vicinity and the northern section of the State of New York is of sufficient importance to justify a recommendation for the expenditure of Government funds at this time on the further improvement of Plattsburg Harbor beyond and in furtherance of the project of the State of New York for the establishment of the northern terminus of the New York State Barge Canal system at this point.

Respectfully,

G. S. NICE, *Secretary.*

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

LETTER OF BOARD OF PUBLIC WORKS OF CITY OF PLATTSBURG, N. Y.

PLATTSBURG, N. Y., *June 25, 1915.*

GENTLEMEN: This is to advise you that at a regular meeting of the board of public works of the city of Plattsburg, held to-day, copy of the communication addressed to you by the secretary of the Plattsburg Chamber of Commerce was read before this body and, by regular vote on a motion duly made and seconded, the statements of fact and the representations therein contained upon the above entitled subject were unanimously approved and adopted, and the same may therefore be considered as coming also from this board, the communication above referred to bearing date of June 24, 1915.

Respectfully,

E. SEYMOUR, *City Clerk.*

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

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[1] Not printed.

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JEL W. M. BLACK, CORPS OF ENGINEERS, U. S. ARMY

House Doc. No. ; 64th Cong., 1st Sess.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 407.

BRIER CREEK, GA.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF BRIER CREEK, GA., FROM ITS MOUTH TO A POINT OPPOSITE WAYNESBORO, IN BURKE COUNTY.

DECEMBER 16, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 15, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated August 19, 1915, together with copy of a report from Col. W. C. Langfitt, Corps of Engineers, dated June 3, 1915, with map, on preliminary examination of Brier Creek, Ga., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, August 19, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Brier Creek, Ga.

1. There is submitted herewith for transmission to Congress report dated June 3, 1915, with map, by Col. W. C. Langfitt, Corps of Engineers, on preliminary examination of Brier Creek, Ga., from its

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mouth to a point opposite Waynesboro, in Burke County, called for by the river and harbor act approved March 4, 1915.

2. Brier Creek is a tributary of Savannah River, which it enters at a point about 91½ miles above Savannah, Ga. The length of the reach under consideration is about 75 miles by the course of the stream. The creek is narrow, crooked, and much obstructed by snags and fallen trees. The district officer, who is also division engineer, states that some of the interests concerned desire a low-water channel for flat boats from the mouth to Waynesboro, while others desire only the opening up of a channel for rafting logs at high water. There is no commerce at present on the stream, and in view of the probable large cost of any adequate improvement even for rafting, and the subsequent cost of maintenance, he expresses the opinion that Brier Creek is not worthy of improvement by the General Government at the present time.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated July 13, 1915, concurring in the unfavorable views of the district officer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Brier Creek, Ga., from its mouth to a point opposite Waynesboro, in Burke County, is not deemed advisable at the present time.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Second indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
July 13, 1915.

TO THE CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. The following is in review of the district officer's report on preliminary examination of Brier Creek, Ga., from its mouth to a point opposite Waynesboro, in Burke County, submitted in compliance with the act of March 4, 1915.

2. This stream lies entirely within the State of Georgia, and empties into the Savannah River 91½ miles above the mouth of the latter. The reach under consideration is about 75 miles in length, following the course of the stream. The creek is narrow, crooked, and much obstructed by snags, trees, and sunken logs. The width generally ranges from 45 to 65 feet, but in places where the flow is divided between several channels the minimum width is not more than 15 feet. The general depth in the pools is from 5 to 6 feet, but on many of the bars it is not over 2 feet and on some it is less.

3. There is no commerce or navigation at present. Formerly the stream was used to some extent for floating small rafts, but even this seems impracticable without considerable improvement. Some of those interested desire a channel suitable for the use of flatboats, while others ask for a channel for rafting at high stages.

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4. The district officer, who is also the division engineer, reports the creek as unworthy of improvement in view of the probable large cost of any adequate improvement, even for rafting.

5. Interested parties were duly informed of the tenor of the district officer's report and given an opportunity of presenting their views, but no communications on the subject have been received.

6. In its present condition this narrow, crooked, and obstructed creek is not navigable even for rafts, and it can be made so only at a cost far in excess of probable resulting benefits, and therefore the board concurs with the district officer and reports that in its opinion it is not advisable for the United States to undertake the improvement of Brier Creek, Ga.

7. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other related subjects having any material bearing upon the improvement of navigation at this locality.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

PRELIMINARY EXAMINATION OF BRIER CREEK, GA.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Savannah, Ga., June 3, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Preliminary examination of Brier Creek, Ga., from its mouth to a point opposite Waynesboro, in Burke County.

1. The river and harbor act of March 4, 1915, provided for a preliminary examination of Brier Creek, Ga., from its mouth to a point opposite Waynesboro, in Burke County. This duty was assigned this office by letter from the office of the Chief of Engineers, dated March 15, 1915. The examination was made by Maj. W. P. Stokey, Corps of Engineers, my assistant, and the following report thereon has been prepared largely by him:

2. *Location.*—Brier Creek lies entirely within the State of Georgia, rising about 48 miles almost due west of Augusta, flowing in a southeasterly direction, and emptying into the Savannah River 91½ miles by river above Savannah. The distance from the source of the creek to its mouth is about 120 miles in a straight line, while by the course of the creek it is probably about 200 miles. The Central of Georgia Railroad bridge was taken to be the "point opposite Waynesboro" specified in the act as the upper limit of the examination. It is about 41 miles from the mouth by a straight line, and probably about 75 miles by the course of the creek.

3. *Previous examinations.*—The only previous preliminary examination of the creek was made in 1905, and covered the portion from its mouth to Garnett, Ga. In the report of this examination, which was published in House Document No. 143, Fifty-ninth Congress, first session, it was stated: "The improvement of Brier Creek

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is not considered feasible, except at enormous expense, and from the investigations made it is certain that the commercial benefits which would result from such improvement would be so small as to be entirely out of proportion to the expense involved."

4. *Watershed.*—The watershed above the Central of Georgia Railroad bridge is about 500 square miles in area, while that of the entire creek is about 900 square miles.

5. *Rainfall.*—The records of the Augusta station give the best indication as to the rainfall on this watershed, although Augusta is not on it. The mean annual rainfall is 48.5 inches, which is distributed throughout the year as follows:

	Inches.		Inches.
December	3.4	June	4.6
January	4.2	July	5.2
February	4.5	August	5.6
Mean for winter	4.0	Mean for summer	5.1
March	4.9	September	3.7
April	3.6	October	2.5
May	3.3	November	3.0
Mean for spring	3.9	Mean for autumn	3.1

6. *Stages.*—The creek at the time the examination was made was said to have been at the ordinary low-water stage, the water being about at the level of the tops of the piles at the Central of Georgia Railroad bridge. Depths and elevations in this report are referred to this stage. It is said that extreme low water is about 1½ feet lower, and that freshets reach a height of about 8 feet.

7. *Discharge.*—A rough gauging made at the highway bridge near Waynesboro showed a discharge of about 400 second-feet.

8. *General description.*—The portion of Brier Creek under consideration is an alluvial stream, which is bordered by a rather extensive swamp on one or both sides, except for a few miles in the vicinityof Millhaven. The creek in a number of places flows along the bluffs which border the swamp. At these places the banks are generally from 8 to 15 feet in height, although some of them are considerably higher. These banks generally show little or no signs of caving. Along the swamp the banks are generally between 1 and 4 feet in height, usually being about 2½ feet. These banks appear to be very stable, and there is nearly everywhere a growth of large trees on both banks extending to the water, and many of the cypress trees grow some distance out in the stream. These trees, with their extensive mass of roots and knees, probably have a great deal to do with preventing erosion of the banks.

9. *Crookedness.*—With the exception of a very few places, the stream is very crooked throughout, though particularly so in the upper part, where both the bends and the reaches are very short. In some places it seemed to be exceptional to be able to see much farther than 100 yards.

10. *Cut-offs.*—There are in the course of the creek many cut-offs and incipient cut-offs, where, on account of the low banks, there is an escape of water from the main channel across the swamp. These incipient cut-offs do not appear to enlarge very rapidly, probably

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on account of the roots and trees through which they have to cut their channel. At many places the creek is divided into two or more channels apparently about equal in every respect.

11. *Width.*—The general width of the creek is from about 45 to 65 feet, although at some places the width is probably from 120 to 150 feet, and at others, where the flow is divided between several channels, there may be no channel where the minimum width is more than 15 feet.

12. *Slope.*—The approximate elevations referred to mean low water at Fort Pulaski of low water on the creek at various points are as follows: Central of Georgia Railroad bridge, 198 feet; Savannah & Northwestern Railroad bridge at Millhaven, 114 feet; mouth of Brier Creek, 45 feet. The estimated distance between the first and second of these points is 40 miles, and between the second and third 35 miles. This would make the average slope in each section about 2 feet per mile.

13. *Depth.*—There are quite a good many bars on which the depth is not over 2 feet, and a few on which the depth is scarcely over a foot. It is said that on some of these the water is but 4 or 5 inches deep when the creek is at its lowest stage. The general depth of the creek is, however, very good, being 5 or 6 feet or more.

14. *Current.*—The current is generally quite sluggish and at very few places is it swift enough to make it noticeably difficult to paddle upstream in a bateau.

15. *Bottom.*—The bottom, where it could be reached with a 6-foot pole, was generally found to be sandy. At a few places it was found to be of fine gravel, and at two or three places there was bedrock or bowlders.

16. *Obstructions.*—The creek is very much obstructed by snags and trees which have fallen or have been cut so as to lie across the stream from bank to bank. There is an enormous number of logs and snags on the bottom, with no indication of their presence on the surface of the water. For a few miles, beginning a mile or two below the mouth of Beaver Dam Creek, the conditions are particularly bad. The Hilton-Dodge Lumber Co. have been cutting timber there for about two years and have left the channel of the creek badly blocked with tree tops, logs, trees cut across the stream for foot logs, and with about six or eight old trestles of a logging railroad, against which a lot of drift has collected. It appears that work of cutting the timber commenced on the lower part of the tract and has proceeded upstream. Where the first timber was cut and the high water has had a chance to clear out the débris the conditions are not so bad.

At Milhaven there is a rock dam, the old headrace and tailrace forming a chute passable with difficulty by bateau. There seems to be no use made of the dam at present.

17. *Bridges.*—Below the Central of Georgia Railroad bridge there are 10 highway bridges and 1 railroad bridge, all of pile-trestle construction, with about 11 feet clear span. On one or two of the highway bridges there is a center span of about 25 feet, supported by a king-post truss. The headroom of the bridges is generally about 8 feet.

18. *Timber.*—The creek runs through excellent timberland for almost its entire length. The Hilton-Dodge Lumber Co. own the greater part of the timber from the mouth to 3 or 4 miles above

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Beaver Dam Creek. They have been cutting in this vicinity for about two years, shipping the logs by tramway to Saxon Landing, on the Savannah River, where they are made up into rafts and floated to Savannah.

19. *Commerce.*—At present there is no commerce on the creek. Formerly, from Millhaven and below, the creek was used at high water for floating small rafts of timber, and the parties interested in this did some work in improving the river. A short distance from the mouth, where there was no good channel, they made some cuts about 15 feet wide and protected their banks with bulkheads. This work appears to be still in very good condition.

20. *Improvement desired.*—The views of interested parties were obtained as to what improvement of the creek is desirable. Some of them think that there should be provided a low-water channel for flatboats from the mouth to Waynesboro. Others desire only the opening up of a channel for rafting logs at high water.

21. *Steamboat channel.*—To permit of low-water navigation of the creek by small flat-bottom steamboats, a large amount of channel improvement would be necessary, particularly where the creek is divided into two or more branches. The large number of snags now in the creek would have to be removed. From the fact that the banks are heavily timbered throughout practically the whole extent of the creek, it is to be expected that a considerable amount of snagging work would be necessary every year. The cost of establishing and maintaining such a channel would therefore be very great.

22. *Possible commerce.*—The Savannah & Northwestern Railroad runs parallel to the creek on the right side at a distance of probably not over 3 miles from Waynesboro to within about 20 miles of the mouth. The railroad is much more accessible for possible commerce, being on high ground, while the creek is in a swamp. On the other side the Savannah River runs about parallel to the creek at a distance which is nowhere more than about 15 miles and averages about 10 miles. There is, therefore, on each side but a small strip of territory the commerce from which is naturally tributary to the creek. Even though freight could be obtained, it is hardly possible that a boat line would be profitable, since the boats would have to be of small capacity, and their speed in such a waterway would necessarily be low.

23. *Channel for rafts.*—To make and maintain a high-water channel for small log rafts such as were formerly used would require little, if any, channel enlargement and a much smaller amount of snagging and similar work than would be necessary for a boat channel.

24. *Channel for large rafts.*—The Hilton-Dodge Lumber Co. stated that unless the creek were improved so that fairly large rafts could be floated at any stage they or any other company operating on a large scale would find it necessary to use a tramroad so that there could be maintained a steady supply of lumber throughout the year. To improve the creek to this extent would be very expensive, and the traffic on it would not justify it.

25. *Channel for small rafts.*—The owners of small tracts of timberland state that at present the only way they can realize anything on their timber is to sell it to one of the large lumber companies at but a small part of its actual value. They charge that the lower part of

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the creek has been blocked so as to prevent their rafting their timber, thus virtually forcing them to sell to the lumber company which has obstructed the creek. It appears very likely that if the creek were opened up the drifting of timber in small rafts at the higher stages might be resumed from Millhaven to the mouth. The amount of this is not determinable, but could not be very large. Possibly, if the stream had never been obstructed by past operations, small expenditures from Savannah River appropriations, as authorized by river and harbor act of July 25, 1912, might have been advisable in cooperation with local contributions of equal or larger amounts.

26. *Terminals, etc.*—There are no public or private terminal or transfer facilities, and there is no question of water-power development or of any other subject connected with navigation.

27. *Conclusion.*—In view of the probable large cost of any adequate improvement, even for rafting and the subsequent cost of maintenance, it is my opinion that Brier Creek, Ga., is not worthy of improvement by the General Government at the present time.

W. C. LANGFITT,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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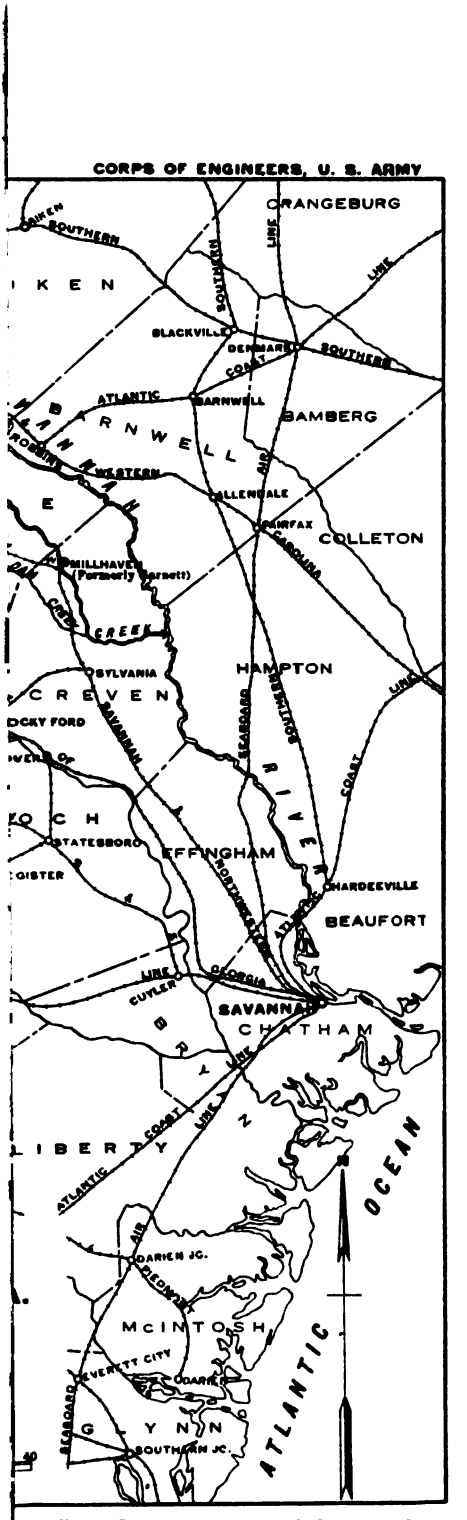

House Doc. No. 64th Cong., 1st Sess.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 408.

QUINCY BAY AND WILLOW SLOUGH, MISSISSIPPI RIVER, ILL.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF QUINCY BAY, ILL., UPPER AND LOWER BAY AND CONNECTING CHANNEL, AND SLOUGH CONNECTING BAY WITH MISSISSIPPI RIVER ABOVE QUINCY.

DECEMBER 16, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 15, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated July 26, 1915, together with copy of a report from Maj. G. M. Hoffman, Corps of Engineers, dated April 20, 1915, with map, on preliminary examination of Quincy Bay, Ill., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, July 26, 1915.

From: the Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Quincy Bay, Ill.

1. There is submitted herewith for transmission to Congress report dated April 20, 1915, with map, by Maj. G. M. Hoffmar, Corps of

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Engineers, on preliminary examination of Quincy Bay, Ill., upper and lower bay and connecting channel, and slough connecting bay with Mississippi River above Quincy, called for by the river and harbor act approved March 4, 1915.

2. Quincy Bay is part of an old bed of the Mississippi River, from which it extends for some distance above the city of Quincy. It has been under improvement by the United States since 1878, as a winter harbor, the project for which provided for a depth of 6 feet at low water over an area of about 90 acres. The gradual shoaling of the bay, which has been particularly evident in the upper portion, has greatly reduced the area available for harbor purposes. Work in the upper section was abandoned many years ago, because of the great cost of maintenance, lack of commercial value, and the belief that the lower bay is sufficiently commodious for present purposes. Willow Slough is about 2¾ miles long and connects the Mississippi River with the upper portion of Quincy Bay at stages above 8 feet. The district officer reports that to reopen this slough would be expensive and without compensating advantages. In conclusion he recommends that the lower bay between the bridges be maintained as heretofore and that no further improvement by dredging or otherwise be made in the bay above the old bridge at the Narrows or at Willow Slough, as such improvement is not warranted by existing or prospective commerce. The division engineer concurs in these recommendations.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated June 15, 1915, concurring in the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Quincy Bay, Ill., upper and lower bay and connecting channel, and slough connecting bay with Mississippi River above Quincy, is not deemed advisable at this time further than to maintain the harbor in the lower bay between the two bridges, which is authorized under the existing project.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
June 15, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's report on preliminary examination of Quincy Bay, Ill., upper and lower bay and connecting channel, and slough connecting bay with Mississippi River above Quincy, called for by the act of March 4, 1915.

2. Quincy Bay is a part of an old bed of the Mississippi River extending along, and for some distance above, the city of Quincy. It

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is closed at the upper end and open to the Mississippi River at the lower end. The bay has been under improvement since 1878 as a winter harbor. Formerly it had considerable depth, but it has gradually shoaled, particularly in the vicinity of Cedar or Whipple Creek, where it is now dry at low stages for a distance of about half a mile, thus dividing the upper and lower bays. The district officer quotes from various reports giving a history of the work done.

3. The adopted project provided for dredging an area of about 90 acres to a depth of 6 feet at low water and the construction of 3 spur dams. The area under improvement extended through the lower into the upper bay. The project was completed in 1895, since which time it has been partially maintained. Owing to the high cost and difficulty of keeping the harbor open opposite Whipple Creek, and the fact that the area below this point between the two railroad bridges was of sufficient capacity, work has in recent years been confined to this section.

4. Willow Slough forms a connection at moderate and high stages between the Mississippi River and upper Quincy Bay, which it enters at a point about a mile above the city of Quincy. The question of reopening this slough or closing it altogether by a levee has been reported upon unfavorably on two previous occasions, the improvement being considered of little commercial value. The district officer states that to reopen and maintain Willow Slough could only be done at great cost and without compensating advantages. He concludes with the recommendation that no work be done in Willow Slough and that improvement in the bay be confined to the maintenance of the present project between the bridges in the lower bay. The division engineer concurs in this recommendation.

5. Interested parties have been advised of the tenor of the district officer's report and given an opportunity of submitting their views to the board. Several communications, including one from the joint committee of the city council and of the Chamber of Commerce of the city of Quincy, have been received and given consideration.

6. From the facts presented, it appears that the area in the lower bay between the bridges is adequate to meet the demands both for commerce and harbor purposes, and that no commensurate advantages would result from work upon Willow Slough, either in opening or completely closing it. The board therefore concurs with the district officer and the division engineer and reports that in its opinion it is not advisable at the present time for the United States to undertake any improvement of Quincy Bay, Ill., upper and lower bay and connecting channel, and slough connecting bay with Mississippi River above Quincy, further than to maintain the harbor in the lower bay between the two bridges, which is authorized under the existing project.

7. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other related subjects which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

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PRELIMINARY EXAMINATION OF QUINCY BAY, ILL.

UNITED STATES ENGINEER OFFICE,
Rock Island, Ill., April 20, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Preliminary examination of Quincy Bay and Willow Slough.

The river and harbor act of March 4, 1915, provides for a preliminary examination of "Quincy Bay, Ill., upper and lower bay and connecting channel, and slough connecting bay with Mississippi River above Quincy." Your letter of March 15, 1915, assigns this duty to me.

I. UPPER AND LOWER BAY AND CONNECTING CHANNEL.

The river and harbor act of June 1, 1878, provided for a survey of the "harbor at Quincy, Ill." A report was rendered by Maj. F. U. Farquhar, Corps of Engineers, January 13, 1878, which was printed as Senate Executive Document No. 53, Forty-fifth Congress, third session, and also in Report of Chief of Engineers, 1879, page 1130. The bay, being considered as the inner harbor of Quincy, was favorably recommmended for improvement as a winter harbor, and estimates for dredging to 6 feet at low water were presented, amounting to $170,000, and embracing a combined area of 90 acres in the lower bay, that portion of the upper bay immmediately above the old railway bridge and the passage connecting it with the main portion of the upper bay. In the above report the bay is thus described:

> Quincy Bay is the part of an old bed of the Mississippi River and extends along the high bluffs above Quincy for about 3½ miles. Near its upper end Bear Creek empties into it; it also has a connection by a slough (Willow Slough) with the Mississippi River above. The width of the bay varies from 200 to 700 feet and the depth of water at lowest stage from 2 to more than 20 feet. Four thousand feet above its mouth it is crossed by a railroad bridge which has a pivot draw in it with two openings 80 feet in the clear. In years gone by, before the lower end of the bay filled up, it was used as a winter harbor for steamboats; but the area of water over 4½ feet deep at lowest stage (which generally occurs in winter) is so small that the harbor is not now used at all. It will be seen that the sand and gravel brought down by a small stream (Whipple Creek) from the bluffs have formed a large part of the filling up of the bay.

A blue print[1] of the survey accompanies this report, which shows the areas to be dredged, the deposits at Whipple Creek, and the entrance of Willow Slough. At the time of the survey there was very deep water in the bay (no bottom at 18 feet) just above what is now the Narrows and no provision was made for dredging any part of the upper bay above the Narrows, all of which had a fair navigable depth. It is remembered that very large towboats and ice barges in early days carried down to St. Louis cargoes of ice from this portion of the bay. While there are now a number of icehouses on the bay none of the product is shipped by water. The project above outlined was approved by Congress and an initial appropriation was

[1] Not printed (new map printed, submitted later).

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made in 1879, and this was followed by other appropriations up to 1896. Since that time allotments have been made from the general appropriation to keep up a sufficiently large and deep area in the lower bay for use as a winter harbor. Attention is invited to the map opposite page 1425, Report Chief of Engineers, 1883. This map shows progress to end of calendar year 1882 in dredging to a grade of 4½ feet below low water. At that time all of the proposed area of the project was covered, but only to a grade of 4½ instead of 6 feet.

In 1885 Congress provided for an examination at the mouth of Whipple Creek (Report Chief of Engineers for 1885, p. 1717, H. R. Ex. Doc. No. 84, 48th Cong., 2d sess.). This examination was made by Maj. A. Mackenzie, Corps of Engineers, with a view to the "removal of the bar and obstructions at and near the mouth of Whipple Creek, in Quincy Bay, Ill.," who reports:

> The location of Whipple Creek is shown on the accompanying sketch. Material brought in by this creek has formed a large bar at its mouth in Quincy Bay. Quincy Bay is undoubtedly worthy of improvement * * * but the entire removal of the bar at the mouth of Whipple Creek has not heretofore formed a part of the plan of improvement, and no such work has been suggested by me in any reports. * * * My present opinion is that the interests involved are of a local rather than of general importance and that the original project for the improvement of Quincy Bay (1878) * * * will furnish a winter harbor sufficient in extent to satisfy the general interests of commerce and navigation.

In 1885, under the Mississippi River Commission, dredging to the amount of 81,000 cubic yards was done on the Whipple Creek Bar to deepen the passage into the upper bay. In 1889 several cuts were made through the bar. In 1890 harbor lines were established on both sides of the bay, running from its mouth to points about 1,200 feet above the Narrows.

In 1891 Maj. Ruffner recommended a retaining levee or bulkhead to prevent Whipple Creek from continually pouring its débris into the Narrows and choking up the passage.

The river and harbor act of July 13, 1892, authorized the construction of a bulkhead with funds available, and the work was carried out in 1893, together with dredging to the amount of 18,000 cubic yards from the Narrows outside the bulkhead. The passage to the upper bay formerly filled up with every rainstorm, but the bulkhead was quite effective for a number of years and until the space inclosed had been completely filled with débris and the bulkhead itself broken in several places.

In 1895 considerable work was done in dredging the passage and repairing the bulkhead. In 1897, 1898, and 1899 there were further repairs to the bulkhead and some additional dredging in the upper bay passage.

The river and harbor act of June 13, 1902, provided for an examination and survey of Quincy Harbor and Bay, which were made and reported on by Capt. C. McD. Townsend, Corps of Engineers (H. Doc. No. 112, 58th Cong., 2d sess.). The map, which makes an excellent showing of the condition of the different parts of the bay in 1902, accompanies this report. Capt. Townsend says in his report on the preliminary examination:

> The plan for the bay (1878) proposed dredging to 6 feet at low water over an area of about 90 acres, and the estimated cost was $170,000. Appropriations have been made and expended to the amount of $130,000. The work has been

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done at a much less cost per cubic yard than was expected, and the entire area has been dredged and some parts of it redredged. Harbor lines have been established, and there would appear to be no further work needed other than that of maintenance of the proper depth in the bay itself and at the entrance. There have been seven surveys of the bay made, the last in 1895.

Capt. Townsend recommended a new survey to determine if any modification of the existing project for the improvement of Quincy Bay was desirable.

In the survey report he says (Dec. 19, 1902):

The original project was completed in 1895. The survey indicates that * * * there has also been considerable deposit in Quincy Bay, somewhat reducing the available width and depth between the two bridges. Above the upper bridge the deposit has been much greater. * * * The accretions in Quincy Bay have reduced the area available as an ice harbor from about 90 acres to about 37 acres, i. e., to the space inclosed by the harbor lines between the two railroad bridges. The sawmill that formerly used this harbor extensively for storing logs has recently burned and will probably not be rebuilt. The space between the bridges appears to be ample for all the boats and barges that at present make use of this harbor, but it is considered probable that deposits from the sewer at the foot of Broadway will ultimately further obstruct the harbor entrance, and a gradual shoaling of the entire area is to be apprehended. It is therefore recommended that the area opposite the Broadway sewer (marked on the map) be dredged to a depth of 6 feet at low water. * * * No modification of the existing project is considered advisable, and the balance available after the work recommended * * * is done should be reserved for redredging the bay.

This is a virtual abandonment of the upper bay and the Narrows.

Some additional dredging was done for maintenance of the lower bay in 1910, 1911, and 1913. The Indian Grave levee district was organized in 1879 and in 1881 built a levee across the head of the bay. Prior to its construction, Bear Creek made a current in Quincy Bay even at medium stages and had a good effect.

Maj. C. S. Riché, district officer, reports, January, 1908:

As regards the bay, the original project involved dredging the lower part and up through the railway bridge to deep water above the bar at Whipple Creek. * * * It has been found very difficult to maintain the channel at the Whipple Creek bar, which filled up so rapidly that a bulkhead was built around the bar and the mouth of the creek diverted toward the upper end of the bay. * * * After the burning of the sawmill and the virtual abandonment of the ice houses (as regards water shipments), no attention was paid to the bay above the upper bridge, and work has for several years been confined to the lower bay.

In another letter, written in 1908, Maj. Riché says:

It is thought that as a harbor of refuge the bay below the upper bridge is of sufficient capacity to accommodate all boats that may have need of it, and that the Government would not be justified in again redredging the Narrows without a guaranty from the city to maintain it. * * * The upper bay does not seem important as regards navigation, and its maintenance as a harbor was discontinued several years ago.

In February, 1909, Maj. Riché says:

The attempt to maintain a suitable depth in the upper bay was abandoned by this office some years ago for several reasons, the chief of which are the great cost of maintenance, lack of commercial value, and the belief that the lower bay is sufficiently large.

Maj. C. Keller, district officer, June, 1910, does not recommend any work in the upper bay, but only for the maintenance of the lower bay and its entrance, to be done from allotments for "dredging in harbors and at landing places."

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Maj. G. M. Hoffman, district engineer, under date of November 15, 1913, gives a résumé of the projects and work performed in Quincy Bay, and says:

A bulkhead was built for the purpose of impounding the heavy deposits of Whipple Creek and keeping them out of the dredged channel. This was only a partial remedy, as the space inclosed by the bulkhead was soon filled up: the bulkhead itself deteriorated and was broken, and much deposit occurred outside in the channel connecting the upper and lower bay, so that it had to be redredged in 1893, 1894, 1895, and 1899, but the channel then dredged is now completely filled up. The attempt to maintain a suitable depth in the upper bay was abandoned many years ago, for the reason of the great cost of maintenance, lack of commercial value, and the belief that the lower bay is sufficiently commodious for present purposes. * * * It has always been intended to keep the lower bay redredged and in suitable condition to be used as a winter harbor.

The inclosed tracing[1] of an examination made in 1915 shows on a small scale the entire bay, with a line of soundings (stage 8.8 feet) from the Mississippi River to its upper end; profile of the soundings is also shown with that of the survey of 1878 indicated for comparison. As will be seen from this map, the bay above the bridge is practically dry at low water, with obstructions at the present mouth of Whipple (Cedar) Creek to a height of 4 feet above low water. This obstruction, partly creek deposits and partly a brush dam or corduroy road built by the icemen, would keep the upper bay at the driest season with its surface about 4 feet above low water, but inaccessible to boats from below. The icemen, with 12 large ice houses, need this dam to hold up and deepen the water in the upper bay to prevent contamination from backwater sewage, but the gasoline-launch men desire its removal so that they may use the bay for pleasure purposes, fishing, and camping.

The upper bay has been created a fish preserve of the State of Illinois, and the rivers and lakes commission of the State, after a public hearing, have ordered the icemen to remove the dam on or before July 1, 1915, the effect of which will probably be to destroy the ice business.

Winter Harbor in Lower Quincy Bay for four years.

Year.	Number of pieces.	Government.	Private.	Total.
		Gross tons.	*Gross tons.*	*Gross tons.*
1914-15	182	860	3,701	4,561
1913-14	190	1,621	2,913	4,534
1912-13	142	2,375	2,111	4,486
1911-12	33	.....	3,467	3,467
Total	547	4,856	12,192	17,048

II. SLOUGH CONNECTING BAY WITH MISSISSIPPI RIVER (WILLOW SLOUGH) ABOVE QUINCY.

The river and harbor act of September 19, 1890, provides for an examination as "to the advisability of reopening Willow Slough, or some other channel from the Mississippi River to Quincy Bay."

[1] Not printed.

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The district engineer, Maj. Ruffner, reports (House Ex. Doc. No. 284, 51st Cong., 2d sess.):

Willow Slough is a low, flat slough 2¾ miles long, connecting the Mississippi River with Quincy Bay when the gauge reads about 5 feet above low water mark. The mouth of this slough is about 1,000 feet above the harbor line limits as recently established, and no dredging was ever contemplated above the Narrows.

Maj. Ruffner concludes:

I do not think it advisable to reopen Willow Slough or any other channel from the Mississippi River to Quincy Bay.

A board of engineers reports February 18, 1891—

that in their opinion the reopening of Willow Slough or some other channel from the Mississippi River to Quincy Bay is not advisable.

The river and harbor act of March 3, 1899, provides for the examination of Willow Slough and vicinity, "with a view to preventing the filling up of Quincy Bay by sediment carried by the river in times of high water." The district engineer, Capt. Townsend, reports with map, a copy of which is inclosed[1] (House Doc. No. 38, 56th Cong., 1st sess.), under date of April 4, 1899, and from his report the following extracts are taken:

The Mississippi River at this locality carries but little matter in suspension, and it is believed that the amount dropped in the bay from this source is hardly appreciable, for in the earlier stages of the rise, when the current is strong, the matter in suspension would naturally go on down through the bay and out into the river again; and later, when the current became slack, the deposit would fall on the land intervening between the river and bay. This latter appears to be the case, as the land is gradually rising and the low places are filling up, notably Willow Slough, which 20 years ago carried water at low stages from the river to the bay and now remains dry until the river has reached an 8-foot stage. * * * The bay above the bridge is of very little commercial importance, although the lower part is valuable and much used as a winter harbor.

To reopen and maintain Willow Slough could only be done at very great cost and without compensating advantages; to prevent such small deposits as it may bring into the bay it would be necessary to construct and maintain a 12-foot levee along the bay shore a distance of 1¼ miles. Capt. Townsend says:

This expensive work is not in my opinion advisable under the circumstances, and I do not recommend any further surveys or estimates.

There has been but little change in the slough conditions since the time of Capt. Townsend's report, and I concur with him and Maj. Ruffner that neither the very expensive reopening of Willow Slough or its closure by a levee is advisable.

In conclusion I recommend that no further surveys of the bay or Willow Slough be made; that the lower bay between the bridges, a very useful winter harbor, be maintained as heretofore; and that no further improvement, by dredging or otherwise, be made in the bay above the old bridge at the Narrows or at Willow Slough as such improvement is not warranted by existing or prospective commerce.

[1] Not printed.

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I would further report that there are no terminal facilities installed in the bay, but such facilities could readily be established, although not at this time needed.

The questions of development and utilization of water power need not be considered at this locality.

G. M. HOFFMAN,
Major, Corps of Engineers.

[First indorsement.]

OFFICE DIVISION ENGINEER, WESTERN DIVISION,
St. Louis, Mo., April 30, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. Forwarded concurring in the recommendations of the district officer that no further surveys of the bay or Willow Slough be made, that the lower bay between the bridges be maintained as heretofore, and that no further improvement by dredging or otherwise be made in the bay above the old bridge, in the connecting channel, or at Willow Slough.

C. McD. TOWNSEND,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors see p. 2.]

LETTER OF THE SECRETARY, JOINT COMMITTEE OF CITY COUNCIL AND CHAMBER OF COMMERCE AT QUINCY, ILL.

QUINCY, ILL., *May 24, 1915.*

GENTLEMEN: Herewith inclosed find a petition of the joint committee of the city council and of the Chamber of Commerce of the city of Quincy appealing from the report of examining engineers unfavorable to dredging upper Quincy Bay and the Narrows, or channel, connecting the upper and the lower bay. Said report was made and dated May 7, 1915.

On behalf of said joint committee, the city of Quincy, its city council and chamber of commerce, and of the people generally, we earnestly call your attention to the inclosed appeal and petition and the need of preserving Quincy Bay in its entirety for public use.

The city of Quincy has under way the project of building extensive terminal facilities on the river front to meet the demands of the present and growing river traffic incident to the opening of the Panama Canal. This, of course, requires the dredging out of the sand bar at the mouth of Quincy Bay and lower Quincy Bay, which we understand the Government engineers intend doing by way of maintenance.

This petition and appeal relates to Quincy Bay generally, and especially to upper Quincy Bay above the upper bay bridge up to the Narrows and beyond, as shown on plats and blue prints on file with the Rivers and Harbors Committee or in the Engineers' office at Washington.

With the closing of the Keokuk Canal and the increase of motor boats, the vessels engaged in river traffic take up lower Quincy Bay, which is also used as a winter harbor and in summer for boats of all kinds and for repairs and a marine boatway. There is a continued pressure for more room in the upper bay, which will increase its commercial use.

If present appropriations do not give the means for a complete dredging of upper Quincy Bay, at least sufficient should be directed to be used to dredge out the Narrows, so that public use of the bay above the Narrows may be maintained and not cut off by the filling in of the Narrows, which will lead riparian owners and private and corporate interests to claim that the upper bay is not navigable and to encroach upon it and inclose it.

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As an arm of the Mississippi River, Quincy Bay, like the river, is a common highway and forever free to the inhabitants of Illinois and all citizens of the United States.

Hon. W. E. Williams, Congressman at large from Illinois, will call the matter to your attention on or about June 1. We submit the matter as urgent and important and request your favorable action.

Respectfully,

CARL E. EPLER,
Secretary of said Joint Committee.

BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

PETITION OF JOINT COMMITTEE OF CITY COUNCIL AND CHAMBER OF COMMERCE OF QUINCY, ILL.

QUINCY, *Ill., May 21, 1915.*

STATE OF ILLINOIS,
Adams County, City of Quincy, ss:

IN THE MATTER OF THE IMPROVEMENT OF UPPER QUINCY BAY.

Whereas in January, A. D. 1914, the joint committee of the city council of the city of Quincy and of the chamber of commerce, an organization of business men and citizens of said city, caused to be presented to the Rivers and Harbors Committee of Congress a petition for the improvement of Quincy Bay, and asking an appropriation to dredge and maintain a navigable channel between the upper and lower bay at or near Quincy, Ill., a copy of which petition is attached hereto and marked "Exhibit A"; and

Whereas a provision was inserted by the committee in the rivers and harbors bill recommended to Congress at its session in 1913–14 for a survey and estimate of such improvement, but that said bill failed of passage as so recommended; and

Whereas the act of Congress on rivers and harbors, approved March 4, 1915, directed a preliminary examination of said "Quincy Bay, Ill., upper and lower bay and connecting channel and slough connecting bay with Mississippi River," with a view to certain improvements therein, and that, on May 7, 1915, notice was given by G. M. Hoffman, major, Corps of Engineers, that said preliminary examination had been made, and that the report submitted thereon is unfavorable to the improvement, and that all interested parties have the privilege of an appeal from said conclusion to the Board of Engineers for Rivers and Harbors at Washington, D. C.; and

Whereas at a meeting of said joint committee of the city council of the city of Quincy and the chamber of commerce, held at Quincy, Ill., on May 18, 1915, a motion was duly made and carried that the chairman and secretary of said joint committee take an appeal from the decision of said local engineers reporting unfavorably as to said improvement in Quincy Bay, and to prepare and forward to the Board of Enginneers for Rivers and Harbors at Washington, D. C., said appeal and the necessary papers and showing in support thereof:

Therefore, in consideration of the premises, the said joint committee of the city council and of the chamber of commerce of the city of Quincy, Ill., do hereby pray and take an appeal from said report of G. M. Hoffman, major, Corps of Engineers, unfavorable to said improvement in Quincy Bay and the channel connecting upper and lower Quincy Bay, to the Board of Engineers for Rivers and Harbors, sitting at Washington, in the District of Columbia, and pray that the conclusion of said unfavorable report be reversed, and that said improvement in said Quincy Bay and the channel connecting upper and lower Quincy Bay be favorably reported and recommended to be made.

In support of said appeal we beg leave to refer to and make part of our presentation of such matter on appeal, the showing made in behalf of said joint committee before the Rivers and Harbors Committee of Congress, on or about January 19, 1914, together with the blue prints, plats, and maps, showing said Quincy Bay and the channel connecting said upper and lower Quincy Bay, and the Government harbor lines extending up Quincy Bay to above the Narrows in upper Quincy Bay.

We also refer to and make part of our showing the findings and order of the Rivers and Lakes Commission of the State of Illinois, made upon a hearing,

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had at Quincy, Ill., on March 5, 1915, directing the removal of a brush dam and certain obstructions at the Narrows in upper Quincy Bay on or before July 1, 1915, a copy of which action is herewith presented and marked "Exhibit B."

The Rivers and Lakes Commission of Illinois was appointed under a statute found in Illinois Session Laws of 1911, page 115, as amended in 1913, Session Laws 1913, page 121, and has power under the act to protect the public waters in Illinois against encroachment or private use. We submit that upper Quincy Bay, including the Narrows, have been navigable waters as navigability is defined in said Illinois statute creating the rivers and lakes commission, and in the cases of Schulte *v.* Warren (218 Ill., 108, 1905), and People *v.* Economy Power Co. (241 Ill., 290, 1909).

Quincy Bay is the best harbor on the Mississippi River between St. Louis and St. Paul, and has been recognized by the United States and the War Department as a winter harbor, and harbor lines have been established in said bay extending into upper Quincy Bay above the Narrows, as appears from the blue prints, maps, and showing made before the Rivers and Harbors Committee in January, 1914.

The War Department has recognized upper Quincy Bay and the channel connecting the upper with the lower bay by dredging the same at various times, from 1879–1882; in 1893–94 a bulkhead was built to impound deposits of Whipple Creek and Cedar Creek and dredging was done in 1893, 1894, 1895, and 1899, but the channel then dredged is now filled up. But we submit that the quarries formerly existing up Cedar Creek have been disused and that vicinity devoted to park purposes, and that much less material washes down said creek than formerly.

Upper Quincy Bay is deemed valuable for prospective factory sites as well as for its commercial and general public uses, and has been navigable for those purposes. Unless some appropriation is made and work done to keep the channel at the Narrows connecting upper and lower Quincy Bay open to admit of its use by the public as in the past, the filling in at the Narrows will lead to a non-user of upper Quincy Bay and invite encroachment upon it by private interests, and would render it more difficult for the people and the Government to protect the rights of the public in upper and lower Quincy Bay.

We further submit that Quincy Bay in its natural condition afforded drainage to the bottom lands north of it, which are now incorporated in the Indian Grave drainage district, and that Quincy Bay, upper and lower, is useful as affording a means of drainage for creeks, bottom lands, and drainage districts north of and tributary to said Quincy Bay.

Since the dam has been built across the Mississippi River at Keokuk, Iowa, by the Mississippi River Power Co., the old Keokuk Canal, in which many steamboats and other water craft made winter quarters, has been closed, thereby making greater the demand for room for harbor purposes in Quincy Bay. Further, the great increase in the number of motor boats, for pleasure and commercial purposes, in recent years, also fills up the room in lower Quincy Bay, and the upper bay is needed to harbor the smaller water craft, and should therefore be dredged and kept open for that purpose, as well as for use by larger vessels, and to give access by water to its shores, available for factory sites.

The U. S. torpedo boat *Somers*, used by the Quincy Naval Reserves, now harbors in Quincy Bay.

We also urge the importance of improving Quincy Bay generally, and dredging out lower Quincy Bay, and make part of our showing the petitions and letters herewith exhibited.

Respectfully submitted.

JOHN T. HUMMERT,
Chairman.
CARL E. EPLER,
Secretary.

EXHIBIT A.

The joint committee of the city council and Chamber of Commerce of Quincy, Ill., on the improvement of Quincy Bay, respectively request, and urge the necessity of, a special appropriation of $75,000 to dredge and maintain a navigable channel between the upper and lower bay and to improve Quincy Bay,

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and in support thereof submit the following reasons and the accompanying showing:

In the past the general appropriations for the improvement of this section of the Mississippi River have not been sufficient to give the proper attention to Quincy Bay. This bay affords the best and largest natural harbor on the Mississippi River between St. Louis and St. Paul, and is about 600 feet in width and extends northerly about 3 miles, and has been until recently navigable for 2 miles from its mouth. The bay affords the finest kind of a winter harbor for vessels of all kinds and has the Quincy Marine Ways with facilities for handling and repairing all sorts of river craft. The increase of river traffic and the use of motor boats has crowded the main shore of Quincy Bay until they seek anchorage and mooring places above the upper bay bridge. In the bluffs along the upper bay are fine limestone quarries and a number of ice houses. Upper Quincy Bay is important to river commerce as a safe harbor at any time of the year, and if the bay is kept open it can accommodate a large fleet of vessels.

The upper bay railroad bridge is opposite Cedar Street. Just north of the city limits Cedar and Whipple Creeks unite west of Front Street and empty into Quincy Bay above the upper bay bridge, and have in the course of years filled in over half way across the bay. The Government has in years past dredged out the bay at the mouth of Cedar Creek and built an embankment to hold back the deposits, but has neglected keeping up this work in recent years. The result has been that the Narrows at the mouth of Cedar Creek barely yield a passage for small boats, and not that when the river is very low. Besides, private parties have placed obstructions at the Narrows at the mouth of Cedar Creek and have there constructed a bridge and dam which completely obstruct the bay.

The harbor lines established by the War Department, as shown by the blue prints, extend above the Narrows nearly to the mouth of Willow Slough, and any dam or obstruction of the bay within the harbor lines is a violation of the act of Congress.

The Federal Government controls and has charge of navigable waters. In times past upper Quincy Bay has been navigable for large boats, and if it is properly dredged and cared for will enlarge and improve the splendid natural harbor that Quincy Bay affords.

We further urge upon Congress that it is the duty of the Government to keep Quincy Bay free from the encroachment of private interests, and if the upper bay is not kept navigable and under the protection of the Government, private interests threaten to dam and entirely shut off the upper from the lower bay and to gradually fill in and occupy the same for private purposes.

Therefore we earnestly urge upon your committee to make the appropriation desired, as demanded by the interests of commerce, navigation, and the general public, as well as of the city of Quincy and its inhabitants.

JOHN T. HUMMERT, *Chairman.*
CARL E. EPLER, *Secretary.*

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

EXHIBIT B.

UNITED STATES OF AMERICA, *State of Illinois, ss:*

BEFORE THE RIVERS AND LAKES COMMISSION OF ILLINOIS.

RIVERS AND LAKES COMMISSION OF ILLINOIS EX REL City of Quincy et al.
v.
ARTHUR A. HUTMACHER AND MAT A. HUTMACHER. } Docket No. 39.

Whereas on, to wit, the 5th day of December, A. D. 1914, Carl E. Epler, a citizen of the State of Illinois, representing himself to be the secretary of the joint committee of the city council of the city of Quincy, a municipal corporation in the State of Illinois, and the chamber of commerce, an organization of business men, citizens, and residents of the said city of Quincy, in said State, filed a complaint in the form of the following resolution:

Resolved, That the joint committee on Quincy Bay request the rivers and lakes commission to take action as to Quincy Bay to remove obstructions at

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the Narrows and to prevent the artificial filling in or obstructing Quincy Bay, a navigable body of water and a tributary of the Mississippi River on the Illinois side thereof, located in said city, in said State; and

Whereas after due investigation on the part of the rivers and lakes commission from time to time from the date of the filing of said complaint up to and including the 5th day of March, A. D. 1915, when a public hearing was held by said commission in said city in relation to said complaint; and

Whereas on the 24th day of February, A. D. 1915, a summons was issued by this commission commanding Arthur A. Hutmacher and Mat A. Hutmacher, doing business under the name and style of Hutmacher Ice Co., in said city and State, to personally appear before the rivers and lakes commission at said hearing held in the said city on the 5th day of March, A. D. 1915; and

Whereas in response thereto the said Arthur A. Hutmacher and the said Mat A. Hutmacher did appear and were represented by their attorney, the Hon. Chauncey H. Wood, and the commission having heard the testimony of the witnesses appearing at said hearing, both oral and documentary, together with the exhibits introduced, all of which testimony has been reduced to writing and filed with the commission and made a part of the record herein, and having heard all of the evidence and the statements of the defendants and the arguments of counsel, the commission finds and certifies—

That it has jurisdiction of the subject matter and all of the parties thereto; that the defendants, Arthur A. Hutmacher and Mat A. Hutmacher, doing business as the Hutmacher Ice Co., did erect and were on the 5th day of March, A. D. 1915, maintaining a dam, which is an obstruction to navigation and an encroachment in what is known as Quincy Bay, a tributary of the Mississippi River in said city and State at a point at or near what is known as the Narrows in said Quincy Bay, where the people of the State of Illinois have rights and interests, thereby interfering with and obstructing the rights and interests of the people of said State. Therefore, in consideration of the premises heretofore stated,

It is hereby ordered by the Rivers and Lakes Commission of Illinois, That the said defendants, Arthur A. Hutmacher and Mat A. Hutmacher, doing business as the Hutmacher Ice Co., are directed and ordered to remove the dam, débris, and other obstructions placed across the said Quincy Bay by them, so that the State of Illinois and its citizens may enjoy their full rights and benefits to the unobstructed use of the said Quincy Bay located at or near the said city of Quincy in the State of Illinois.

It is further ordered, That this order shall take effect and be carried out on or before the 1st day of July, A. D. 1915.

ARTHUR W. CHARLES, *Chairman.*
LE ROY K. SHEBMAN, *Commissioner.*
THOMAS J. HEALY, *Commissioner.*
CHAS. CHRISTMANN, *Secretary.*

[SEAL.]

MARCH 5, 1915.

UNITED STATES OF AMERICA, *State of Illinois, ss:*

I, Charles Christmann, secretary of the Rivers and Lakes Commission of Illinois, do hereby certify the above and foregoing to be a true, perfect, and complete copy of a certain order made and entered of record in a certain cause lately pending before said commission, wherein the Rivers and Lakes Commission of Illinois ex rel City of Quincy et al. was complainant and Arthur A. Hutmacher and Mat A. Hutmacher were defendants.

In witness whereof I have hereunto set my hand and affixed the seal of said Rivers and Lakes Commission of Illinois at Chicago this 20th day of May, A. D. 1915.

CHARLES CHRISTMANN, *Secretary.*

LETTER OF THE EXCELSIOR STOVE & MANUFACTURING CO.

QUINCY, ILL., *May 20, 1915.*

GENTLEMEN: Desire to direct your attention to the condition of the Quincy Bay north of the upper bay bridge. If that part of the upper bay, including the Narrows, were dredged so that the upper bay could be used as a navigable stream, the lands adjacent to the stream would be especially adaptable for fac-

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tory sites. Are of the opinion that the interests of the people would best be conserved by dredging the narrows and the upper bay at this time.

With best wishes, we are,

Yours, truly,

EXCELSIOR STOVE & MANUFACTURING CO.,
JOHN J. FISHER, *President.*

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

PETITION OF CITIZENS OF QUINCY, ILL.

QUINCY, ILL., *May 21, 1915.*

GENTLEMEN: We, the undersigned citizens and business men of Quincy, Ill., hereby petition your honorable body to recommend the improvement and dredging of upper Quincy Bay above the upper bay bridge and of the narrows or channel connecting the upper and lower parts of Quincy Bay, and represent that said upper bay at present and in times past has been open to public use for the passage of boats for commercial and other purposes, and the ordinary uses of water traffic; that on the shores of said upper bay there are ice houses and stone suitable for quarries, and that the east or main shore of said upper bay is suitable and valuable for factory sites and business purposes for which access by water is necessary; that, unless said upper bay and the Narrows are kept open for public use, private interests will encroach thereon and the channel through the Narrows will become impassable unless proper action to remedy this condition is taken; that the Government harbor lines extend above the Narrows, and that public interests and the growing traffic on the Mississippi River demand that Quincy Bay and the upper bay be kept open for water traffic.

J. F. C. SCHOTT, *J. B. Schott Saddlery & Manufacturing Co.*
CHAS. E. SIONBERGER, *manager, Aldo Sommer's Drug Co., wholesale.*
JOS. KNITTEL, *President, Joseph Knittel Show Case Co.,*
and 81 others.

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

LETTER OF MR. CARL E. EPLER.

QUINCY, ILL., *May 24, 1915.*

DEAR SIR: Your favor of the 21st instant, as to Quincy Bay, duly received. I have expressed to the joint committee your sincere thanks for their resolution as to your services, which was just and well deserved.

On Monday, May 24, I mailed to the Board of Engineers for Rivers and Harbors, rooms 507–510, Colorado Building, Washington, D. C., the appeal petition, with certified copy of the action of the rivers and lakes commission of Illinois, ordering the obstructions removed from the narrows of Quincy Bay, with a petition and letters attached thereto, and which petition refers them to the blue prints, maps, and showing made before the Rivers and Harbors Committee at Washington on or about January 19, 1914, for Quincy Bay, which are on file in the offices of that committee or with the engineers at Washington.

Our joint committee thank you for your kind offer to call the matter orally to the attention of the Board of Engineers, and I state in my letter accompanying the petition to the Board of Engineers that you will also call the matter to their attention on or about June 1. You can refer to said appeal petition on file, with the showing we presented to the Rivers and Harbors Committee, and I send you a copy of my letter to the Board of Engineers, which may put you in mind of the points in view.

If the Board of Engineers stand on the report of the examining engineers on the ground of lack of commercial use and great expense of dredging the upper bay, suggest and urge that they at least have the narrows dredged, so that public use of that channel and upper Quincy Bay will continue in order to prevent its loss to the public. That would not cost so much and should be the least that should be done now anyhow.

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The whole city is very strongly behind this matter. You may say that the joint committee wish the sand bar at the mouth of the bay dredged as well as the lower bay, but that it is also highly important to preserve the upper bay to the public.

Thanking you for your kind assistance in the past and wishing you all success, I remain,

Yours, truly,

CARL E. EPLER.

Hon. W. E. WILLIAMS,
Washington, D. C.

LETTER OF MR. C. E. EPLER.

QUINCY, ILL., *May 29, 1915.*

DEAR SIR: In the matter of Quincy Bay, the joint committee took an appeal to the Board of Engineers at Washington, D. C., and I have written you at Washington referring to petitions on file with the Board of Engineers and our showing made before the Rivers and Harbors Committee on or about January 19, 1914.

I call this to your attention as you said you would be down there about June 1, and the committee are obliged to you for your kind offer to urge the matter upon the attention of the Board of Engineers.

If they have not means enough to have the upper bay dredged in full, press the importance of keeping the narrows open and dredge some so as to admit of its use by the public. Of course, we do not know what the board will do, but it is our duty to call the matter to their attention and to press its importance, for otherwise the bay may be shut off and encroached upon.

Wishing you all success in your many endeavors, I remain,

Your, truly,

C. E. EPLER.

Hon. W. E. WILLIAMS, *Pittsfield, Ill.*

LETTER OF MR. CARL E. EPLER.

QUINCY, ILL., *June 12, 1915.*

GENTLEMEN: Hon. W. E. Williams, Congressman at Large, here attending the State Bar Association, informs me that he presented the matter of improving upper Quincy Bay to you recently. He also said that the matter of a channel from the Mississippi River to Quincy Bay as perhaps a solution of keeping the bay open was discussed.

I take the liberty of inclosing a statement from Enoch R. Chatten, civil engineer, which will convey to you the information as to where such a channel could be cut, subject, of course, to the advice and decision of the Government engineers.

Commending the matter to your earnest consideration, I remain,

Yours, respectfully,

CARL E. EPLER,
Secretary Joint Committee.

BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

LETTER OF MR. ENOCH R. CHATTEN.

QUINCY, ILL., *June 12, 1915.*

GENTLEMEN: At the request of the joint committee of the city council and Chamber of Commerce of the city of Quincy, Ill., I make the following statement in connection with the improvement of upper Quincy Bay.

My name is Enoch R. Chatten, I reside at Quincy, Ill., am 69 years of age, and am a civil engineer by profession. At various times I have been city engineer of the city of Quincy for 29 years, and am familiar with Quincy Bay and its surroundings, and have also done survey work in connection with building the Indian Grave levee at the head of Quincy Bay. With C. E. Gantert, C. E.,

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I made a survey and plat of upper Quincy Bay and the Narrows about January 1, 1914, when the river was at about low-water mark, which plat and survey was used at the showing made at Washington before the Rivers and Harbors Committee in Congress.

I have always been of opinion that the most practicable and permanent way of keeping open upper Quincy Bay would be to cut a channel from the Mississippi River to Quincy Bay above the Narrows, and I am of opinion that when the Narrows in the upper bay are dredged out that the current would keep the channel through the Narrows and upper Quincy Bay open and also tend to cut away the sand bar forming at the mouth of Quincy Bay in front of the harbor landing of the city of Quincy. When the levee was built at the head of Quincy Bay for the Indian Grave drainage district, it cut off Big Slough, and the natural current that kept Quincy Bay open. The channel from the river here suggested would tend to have the same effect. It would leave the river some distance above the river railroad bridge.

I have gone over Quincy Bay Island and have surveyed in that vicinity, and think such a channel from the river to Quincy Bay could be cut to advantage. Such channel from the river to the bay could be cut beginning on the west shore of Quincy Bay about three-quarters of a mile above the Quincy Bay bridge, at the mouth of Willow Slough, one-quarter of a mile up Willow Slough, and then north and west to the river, about 10° north of west, the distance from the bay to the river on that line being about three-quarters of a mile, and which channel could follow in a measure low places and swales. The land the channel would cross is not of much value, and could doubtless be procured for that purpose.

Further, this channel would not only keep the Narrows open but would wash out the deposits brought down by Whipple Creek and Cedar Creek and would tend to keep the creeks from filling in upper Quincy Bay at or near the Narrows.

The matter of cutting such a channel from upper Quincy Bay to the river, to my mind, would prove a solution of the vexed question of keeping upper Quincy Bay open, giving a channel through the bay, and in a measure at least keeping the Quincy Harbor free from the sand bar that has of late years formed there.

Respectfully submitted.

ENOCH R. CHATTEN, *C. E.*

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

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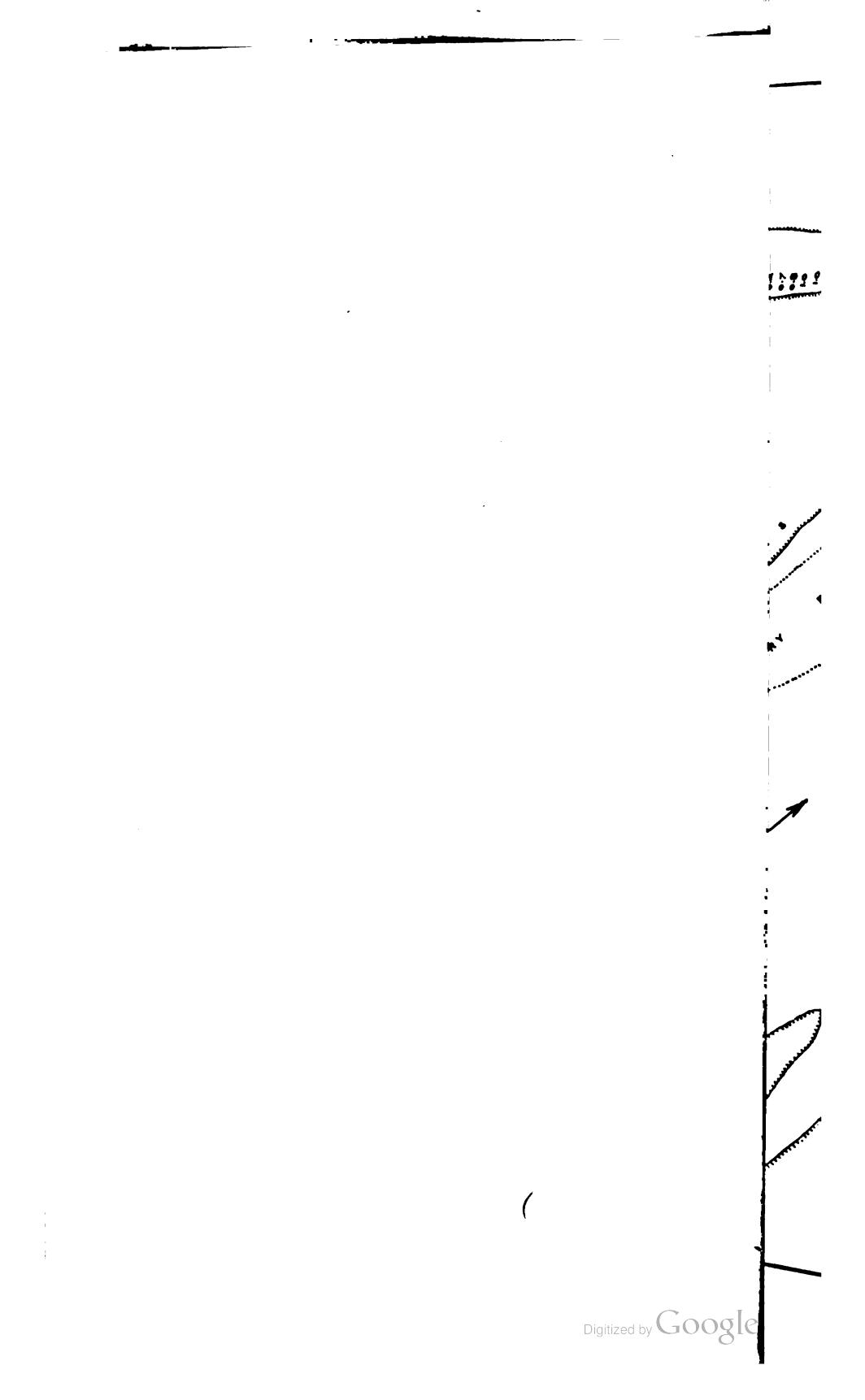
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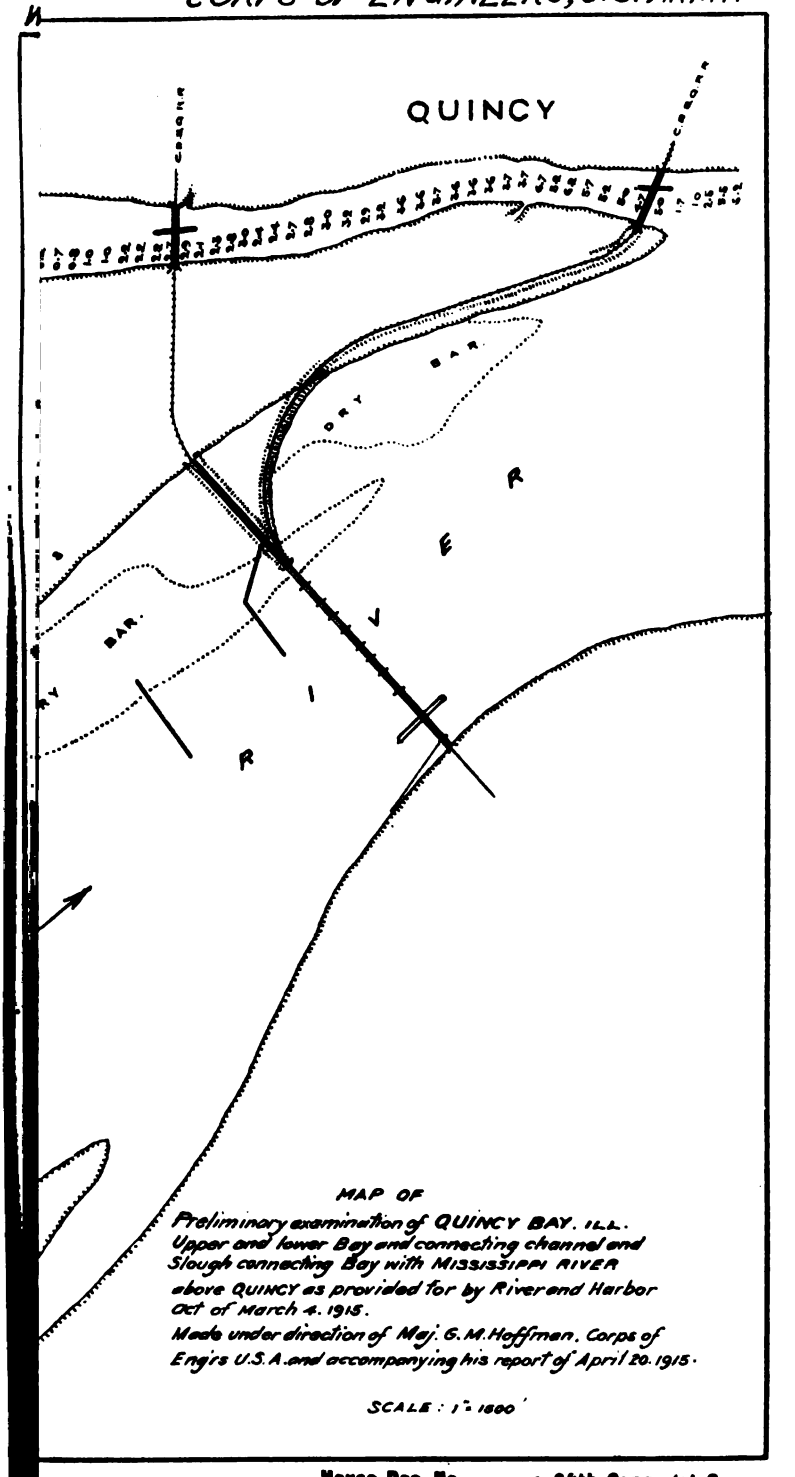

MAP OF
Preliminary examination of QUINCY BAY. ILL.
Upper and lower Bay and connecting channel and
Slough connecting Bay with MISSISSIPPI RIVER
above QUINCY as provided for by River and Harbor
Act of March 4. 1915.
Made under direction of Maj. G.M. Hoffman. Corps of
Engrs U.S.A. and accompanying his report of April 20. 1915.

SCALE: 1" = 1800'

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 409.

NOVATO CREEK, CAL.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF NOVATO CREEK, CAL.

DECEMBER 16, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 15, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated July 8, 1915, together with copy of a report from Lieut. Col. Thos. H. Rees, Corps of Engineers, dated May 8, 1915, on preliminary examination of Novato Creek, Cal., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, July 8, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Novato Creek, Cal.

1. There is submitted herewith for transmission to Congress report dated May 8, 1915, by Lieut. Col. Thos. H. Rees, Corps of Engineers,

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on preliminary examination on Novato Creek, Cal., called for by the river and harbor act approved March 4, 1915.

2. Novato Creek is a small crooked stream emptying into San Pablo Bay at a point about 1¼ miles south of the mouth of Petaluma Creek. It is practically dry at low water, but at high water there is a navigable depth of from 4 to 5 feet. The principal obstruction to navigation is a railroad drawbridge which is poorly located and in a state of disrepair. The improvement desired is the clearing and straightening of the channel, dredging to a depth of 4 feet at low water and the relocation and reconstruction of the drawbridge. The district officer, who is also division engineer, states that a branch of Petaluma Creek, known as Black John Slough, reaches a point as near the town of Novato as does Novato Creek, and in its natural condition provides a better navigable channel than Novato Creek. He is of opinion that no great increase of commerce would result from the desired improvement and that the United States would not be justified in undergoing any expense for the improvement of Novato Creek at the present time.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors and attention is invited to its report herewith, dated June 29, 1915, concurring in the views of the district officer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Novato Creek, Cal., is not deemed advisable at the present time.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
June 29, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's report of preliminary examination of Novato Creek, Cal., called for by the act of March 4, 1915.

2. Novato Creek is a small crooked stream emptying into San Pablo Bay at a point about 1¼ miles south of the mouth of Petaluma Creek, which is now under improvement by the United States. Novato Creek is practically dry at low water, but at high water there is a navigable depth of from 4 to 5 feet. A canal of about the same depth, 30 feet wide and 400 yards long, built by local interests, extends from the creek to within one-half mile of the center of Novato. The creek channel is narrow and tortuous, but the principal obstruction to navigation is a railroad drawbridge, which is poorly located and in a state of disrepair. There appears to be no commerce on this stream at present, but there is a small commerce on Black John Slough, a tributary of Petaluma Creek, which approaches as near the village of Novato as does Novato Creek and affords somewhat better navigation.

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3. The improvement desired is clearing and straightening the channel, dredging to a depth of 4 feet at low water, and the relocation and reconstruction of the drawbridge.

4. The report states that it has not been shown that any marked benefit would come to the community as a result of this improvement; that it is not believed that railroad rates would be lessened; that the improvement would be purely local and that it would involve the dredging of an entrance channel through the wide flats of San Pablo Bay as well as the dredging of the creek itself. The district officer, who is also the division engineer, reports the locality as unworthy of improvement by the United States.

5. Interested parties have been advised of the tenor of the district officer's report and given an opportunity of presenting their views to the board, but no communications on the subject have been received.

6. From the facts presented by the district officer it appears that the commerce involved is small; that the improvement desired would be expensive, both in first construction and in subsequent maintenance; and that an existing waterway, naturally better adapted for navigation than Novato Creek, is equally available. In view of these conditions, the board concurs with the district officer and reports that, in its opinion, it is not advisable for the United States to undertake the improvement of Novato Creek, Cal.

7. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other related subjects which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

For the board.

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

PRELIMINARY EXAMINATION OF NOVATO CREEK, CAL.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE, FIRST DISTRICT,
San Francisco, Cal., May 8, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Preliminary examination of Novato Creek, Cal.

1. This examination was authorized by the river and harbor act of March 4, 1915, and was assigned to this office by letter, Chief of Engineers, March 15, 1915.

2. The physical examination of the locality was made April 13, 1915, by Capt. R. Park, Corps of Engineers, assistant in this office, and his report is as follows:

This is a report on the preliminary examination of Novato Creek, Cal.

The proposed improvement is intended to benefit the town of Novato, the adjacent region, and local interests, and consists in dredging the canal and creek to 4 feet at low tide, clearing and straightening parts of the channel, and the establishment of a draw, in the railroad bridge, properly located and efficiently operated.

Novato was visited April 13, 1915, via Black John Slough, an estuary of Petaluma Creek. The trip was made in one of the small boats of the *Suisun* from the mouth of the slough to its end, at about half tide. Some difficulty was found in crossing the

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mud bar, there being little over 1 foot of water for a distance of 20 or 30 yards. From the bar to the end of the slough from 5 to 8 feet of water was found in the channel. The slough for a distance of about 1¼ miles was about 50 yards wide, for the next quarter of a mile was about 30 yards wide, and for the balance, one quarter, not over 10 yards wide. During the wider stretch the channel hugged one side of the slough under a steep bank, whose crest was about 6 feet above the water, but in the narrow stretch the channel seemed to fill up the whole span between banks.

From the head of the slough the trip was made on foot, following marshland along a dirt road for half a mile to the surfaced road leading from Novato to Black Point, thence on this road to Novato, one-half mile.

From Novato the trip was continued to a canal dredged from a point about one-half mile from the center of Novato, about 400 yards to Novato Creek, thence along the dikes of Novato Creek to the Northwestern Pacific Railroad drawbridge, east of the station Ignacio. At about high tide there was found to be about 5 feet of water in the canal, bottom soft, and about 5 feet of water in the creek, bottom hard. The canal was about 30 feet wide, the creek about 20 feet wide in the clear to within a short distance of the drawbridge, where it was from 50 to 60 feet wide. The creek channel appears to have become narrowed down by the thick growth of reeds and swamp grass on the banks. On account of a rough sea in San Pablo Bay it was impracticable to go from the creek to the bay over the mud flats, but from information furnished by a Novato man who has towed barges into the creek from the bay, there is plenty of water at high tide to float anything that can be floated at high tide in the upper creek, but the channel is very crooked and difficult to follow. Several dredges were observed working on the dikes which protected some ranchers south of the railroad bridge.

At low water the canal retains a little water, but the creek, down as far as the drawbridge, becomes dry. The canal was dredged by public subscription for use as a harbor for unloading grain and alfalfa from scows towed up the creek from San Pablo Bay at high water. At the time the canal was dredged the creek was frequently entered by launches with small scows in tow, but in late years few barges have come in. It is claimed that much shoaling has occurred and that the channel has been narrowed by the growth of reeds and swamp grass.

Complaint was informally made that the railroad company had always been slow to respond to requests for passage through the draw, and lately had refused to open for a dredger under contract to work somewhere beyond the bridge. Upon inspection, the reason why the railroad company refused to open the draw became apparent. The circular track upon which the wheels of the turntable travel is broken and the body of the turntable is blocked up by 12 by 12 inch blocks resting on the track foundations.

This drawbridge spans the creek at an angle of approximately 40° with the line of the channel. The draw span is a girder section, pivoted at the west end. When the draw is closed the west end rests upon a circular track, the east end upon a bent of the shore trestle. To open the draw the east end is raised slightly by means of a shears and hand winch and the draw swung upstream by hand power. The draw span is about 45 feet long and has a clear opening of about 40 feet. The east abutments are strengthened by pile clusters upstream and downstream, the downstream cluster set well into the channel and within about 20 feet of the east bank. Thus, a boat in passing this draw upstream must first negotiate the 20-foot opening south of the draw, then turning northwest pass the draw opening, 40 feet in the clear, then turning north pass out between the bank and the upstream pile cluster, giving about 15 feet clearance.

The person most interested in the improvement of Novato Creek appears to be Mr. R. H. Trumbull, who is the manager of the Novato Land Co. and owner of the Novato Lumber Co. Novato itself possesses between 20 and 30 stores, shops, factories, hotels, and other places of business. The adjacent territory is devoted mostly to dairying. All exports and imports are now handled by the Northwestern Pacific Railroad except for some alfalfa and grain brought in barges by way of Black John Slough. The chief products of this section are poultry, eggs, French cheese, and other ranch products. The chief imports are alfalfa, lumber, grain, and general merchandise. Mr. Trumbull has been requested three times to furnish the usual information on commerce statistics, population, freight rates, territory affected, etc., but no data have been furnished. It is roughly estimated that the products of the territory that would be affected by the improvement of Novato Creek are valued at about $300,000 annually and that supplies are brought into the section valued at about $200,000.

It is not believed that the improvement of Novato Creek would lead to water shipments of much of the exports, inasmuch as the outgoing commerce is mostly of a

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perishable nature, of tonnage small in comparison to value, and is well handled now by railroad freight and Wells-Fargo Express. Even now considerable alfalfa and grain are brought in by water to Black John Slough and handled overland, and it is not believed that a great increase of water-borne commerce would result upon the improvement of Novato Creek. Probably all the imports now brought in via Black John Slough would be diverted to Novato Creek.

The objection to the use of Black John Slough seems to be that the landing place at the head of navigation is on private property, connected by a private road one-half mile long to the public highway at a point one-half mile from the center of Novato, and that the owner of the property and private road objects to this use of his property.

It is believed, in case a drawbridge were placed across Novato Creek, properly located so as not to obstruct the channel, and efficiently operated so as to cause no unnecessary delay to shipping, that scows, barges, launches, and small sailing schooners drawing 4 feet of water could at high water safely navigate the creek to the head of the canal. It is thought that in this case craft such as those above mentioned would be attracted to the town and would be able to handle all Novato tonnage which could reasonably be expected to seek water transportation. In fact, Mr. R. H. Trumbull, when asked if, in his opinion, the draw were properly placed and efficiently operated, the creek would be navigated by craft capable of handling the present and prospective water-borne commerce of Novato, answered in the affirmative, stating that the present condition of the drawbridge constituted the worst obstruction to the navigation of the creek.

A citizen of Novato has deeded to the town the strip of land in which the canal is dredged and the community raised the funds (about $2,500) for the canal.

SUMMARY.

(*a*) Novato Creek, from the head of a canal one-half mile from the center of Novato through the mud flats of San Pablo Bay, is dry, or nearly so, at low water. At high water the canal and creek have from 4 to 5 feet of water.

(*b*) Navigation of Novato Creek is now and for some time past has been obstructed by the damaged drawbridge of the Northwestern Pacific Railroad, but it is believed that, with the draw properly placed and efficiently operated, craft drawing up to 4 feet would be attracted to the creek and could safely navigate it to the head of the canal.

(*c*) Data requested concerning commerce and industries have not been received, but it is estimated that there is about $200,000 worth of ingoing commerce and about $300,000 worth of outgoing commerce, most of which is handled by the railroad and express companies, some alfalfa and grain being shipped in via Black John Slough.

(*d*) Improvement desired consists in clearing and straightening the channel, dredging to a depth of 4 feet at low water, and the establishment of a draw in the railroad bridge located so as not to obstruct the channel and efficiently operated. It would be hard to interest the community to make a substantial contribution toward these improvements, $2,500 having already been sunk in the construction of the canal.

(*e*) It has not been shown that any marked prosperity would come to the community as a result of this improvement, nor is it believed that the existing railroad freight rates would be lessened. Alfalfa, lumber, and grain would be brought in probably much more cheaply by water than by rail.

(*f*) There already exists from Petaluma Creek to a point within 1 mile of the center of Novato a navigable slough called the Black John Slough, with depths, at high water, varying from 10 feet near Petaluma Creek to 5 or 6 feet at the head of navigation, the only obstruction being a narrow mud bar at the mouth. Shipments of alfalfa and grain are frequently brought in through this slough.

(*g*) There is no question of water-power sites nor, apparently, of terminal rates.

(*h*) It is not believed that the United States would be justified in undergoing any expense for the improvement of Novato Creek.

3. The vicinity has also been visited by the district engineer officer, who is also division engineer, whose observations confirm the statements in the above-quoted report and who concurs therein.

4. Black John Slough, a branch of Petaluma Creek, reaches a point as near to the town of Novato as does Novato Creek, and in its natural condition provides a better navigable channel than Novato Creek. Petaluma Creek is under improvement by the United States, and an entrance channel about 2.5 miles long has been dredged through the

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wide flats of San Pablo Bay. The improvement of Novato Creek would involve the dredging of a similar entrance channel across these flats as well as the dredging of the creek itself.

5. A branch of the State highway of California will cross Novato Creek by a drawbridge near the drawbridge of the Northwestern Pacific Railroad and will add to the difficulties of navigating Novato Creek.

6. The proposed improvement would be purely local and would serve only the town of Novato and the immediate vicinity. No connection would be made with any through lines of transportation.

7. For the above reasons I am of the opinion that Novato Creek, Cal., is not worthy of improvement by the United States at the present time.

THOS. H. REES,
Lieut. Col. Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors see p. 2.]

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 410.

NEW YORK HARBOR, N. Y., REMOVAL OF SHOAL IN GOWANUS BAY.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF NEW YORK HARBOR, N. Y., WITH A VIEW TO REMOVING THE SHOAL IN GOWANUS BAY TO A DEPTH UNIFORM WITH BAY RIDGE CHANNEL.

DECEMBER 16, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 15, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated August 12, 1915, together with copy of a report from Col. Frederic V. Abbot, Corps of Engineers, dated June 23, 1915, with map, on preliminary examination of New York Harbor, N. Y., shoal in Gowanus Bay, made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, August 12, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of New York Harbor, N. Y., shoal in Gowanus Bay.

1. There is submitted herewith for transmission to Congress report, dated June 23, 1915, with map, by Col. Frederic V. Abbot,

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Corps of Engineers, on preliminary examination of New York Harbor, N. Y., with a view to removing the shoal in Gowanus Bay to a depth uniform with Bay Ridge Channel, called for by the river and harbor act, approved March 4, 1915.

2. The shoal referred to is a middle ground, having a minimum depth of about 12 feet lying between Bay Ridge and Red Hook Channels on the east, and the main channel through the upper bay to North River on the west. The removal of a part of the easterly side of the shoal at the junction of Bay Ridge and Red Hook Channel has been recommended to Congress in report printed in House Document No. 863, sixty-third Congress, second session, and the removal of a strip on the westerly side bordering the main ship channel has been favorably recommended in report printed in House Document No. 518, Sixty-third Congress, second session. The district officer is of opinion that the removal of this shoal to a greater extent than contemplated by the above-mentioned reports is not necessary at the present time, and in this opinion the division engineer concurs.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated July 27, 1915, concurring in the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of New York Harbor. N. Y., with a view to removing the shoal in Gowanus Bay to a depth uniform with Bay Ridge Channel, is not deemed advisable at the present time to a greater extent than has already been recommended in reports printed in House Documents Nos. 863 and 518, Sixty-third Congress, second session.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
July 27, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's report on preliminary examination of New York Harbor, N. Y., with a view to removing the shoal in Gowanus Bay to a depth uniform with Bay Ridge Channel, called for by the act of March 4, 1915.

2. The shoal referred to is a middle ground lying between Bay Ridge and Red Hook Channels on the east and the main channel through the upper bay to North River on the west. The depth on the shoal ranges from about 12 to 30 feet. The mean tidal range is about 4½ feet.

3. The removal of a part of the eastern side of the shoal and of a strip on the western side has already been favorably recommended to Congress in reports printed in House Documents Nos. 863 and 518,

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Sixty-third Congress, second session, as explained in detail by the district officer. Aside from these improvements, additional dredging is now requested on the lower portion of the shoal in order to provide a shorter course for vessels crossing from the west to the east side of the harbor and vice versa and on the upper portion of the shoal in order to provide more commodious anchorage area for vessels of draft not exceeding 23 feet.

4. The district officer discusses the alleged need for the additional dredging and finds no necessity for improvement beyond what is already recommended in the reports referred to above. He therefore expresses the opinion, in which the division engineer concurs, that such further improvement by the United States is not justified at the present time.

5. Interested parties have been informed of the tenor of the district officer's report and given an opportunity of expressing their views to the board. Two communications have been received and given consideration.

6. It appears that ample provision for the present and immediate future will be made if the projects referred to above are carried out. Until this has been done and the facilities thus afforded have proved to be inadequate, it is believed that no additional work should be undertaken. The board therefore reports, in concurrence with the views of the district officer and the division engineer, that at present it is not advisable for the United States to undertake the removal of the shoal in Gowanus Bay to a greater extent than has already been recommended.

7. In compliance with law the board reports that there are no questions of terminal facilities, water power, or other related subjects which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

PRELIMINARY EXAMINATION OF NEW YORK HARBOR, N. Y., SHOAL IN GOWANUS BAY.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE, SECOND DISTRICT,
New York City, June 23, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Preliminary examination of shoal in Gowanus Bay, New York Harbor.

1. The river and harbor act of March 4, 1915, directed an examination and survey of New York Harbor, N. Y., with a view to removing the shoal in Gowanus Bay to a depth uniform with Bay Ridge Channel.

The duty of making this examination and survey was assigned to this office.

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GEOGRAPHICAL DESCRIPTION.

2. For purposes of river and harbor improvement the term Gowanus Bay has in the past been considered as including all of the east side of the upper bay, New York Harbor, including channels along the Brooklyn water front from Red Hook on the north nearly to Fort Hamilton on the south, a distance of 4 miles, and the shoal between those channels and the main channel through the upper bay to the North River. The "shoal in Gowanus Bay" is at the present time a middle ground lying between Bay Ridge and Red Hook Channels on the east and the main channel through the upper bay to North River on the west. (See accompanying map.)

APPROACHES.

3. The approaches to the shoal in question are Red Hook and Bay Ridge Channels on the east and the main channel through the upper bay on the west. The main channel on the west and Bay Ridge Channel on the east already have depths of 40 feet at mean low water. If work now in progress on Red Hook Channel be not interrupted, the depth in Red Hook Channel will in a few months' time be 40 feet at mean low water. The mean range of tide is about 4½ feet.

PREVIOUS REPORTS AND WORK PREVIOUSLY DONE.

4. In its natural condition Gowanus Bay as above described shoaled gradually from the main channel to the Brooklyn shore. The work done under various projects for the improvement of Red Hook and Bay Ridge Channels and reports heretofore submitted in reference to those channels may, strictly speaking, be considered as applicable to the original "shoal in Gowanus Bay." So far, however, as the matter now in hand is concerned, these previous reports and work previously done have merely resulted in the existence at the present time of a middle ground of shoal water between the natural main channel through the upper bay and the artificial channels along the Brooklyn water front.

5. In addition to the reports made and work done on Bay Ridge and Red Hook Channels, three reports in reference to certain parts of the middle ground as it now exists have been called for by Congress, as follows:

(*a*) The river and harbor act of March 3, 1905, called for "an examination of Bay Ridge Channel, with a view to the construction of a breakwater opposite the wharves."

(*b*) The river and harbor act of March 4, 1913, called for an examination and survey of "New York Harbor, N. Y., upper bay, with a view to improving channel opposite the anchorage grounds," and "New York Harbor, N. Y., with a view to securing additional width in Bay Ridge and Red Hook Channels."

6. The report submitted in compliance with the act of March 3, 1905, was printed as House Document No. 65, Fifty-ninth Congress, first session. The report was unfavorable to the project. Some plans were advanced at that time for making the proposed breakwater a nucleus for an island, to serve as a landing point for large vessels, but no imperative demand for such a landing was shown to exist.

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7. In the spring of 1915 a bill was introduced into the Legislature of the State of New York, authorizing the Commissioner of the Land Office to grant to unnamed parties the land under water covering a considerable portion of this shoal. The newspapers at the time published prints showing a development of wharves, etc., along the front of a proposed island on land to be ceded in accordance with the bill in question. The island was to be connected with the Brooklyn shore by subways for railroads.

8. When this proposition became generally known to the public opposition developed and the bill was not passed by the legislature.

9. The report of an examination and survey of "New York Harbor, N. Y., Upper Bay, with a view to improving channel opposite anchorage ground," in accordance with the act of March 4, 1913, was published as House Document No. 518, Sixty-third Congress, second session. In this report it was recommended that the channel opposite the deep-water anchorage ground be widened and deepened to a width of 2,000 feet, with depth of 40 feet, as an extension of Ambrose Channel. The proposed extension of Ambrose Channel is shown on the accompanying map as area "B," and it will be seen that the execution of this project will be in effect the removal to 40 feet of a portion of the shoal now under examination. The estimated cost of this work was $830,000, it being contemplated that the actual dredging would be done by Government plant already belonging to the Ambrose Channel improvement.

10. Provision for carrying out this project was included in the House bill for rivers and harbors passed by the House during the Sixty-third Congress, second session. The provision was stricken out along with provisions for other new work when the bill was finally passed appropriating a lump sum for maintenance and repair of existing river and harbor works.

11. The report of an examination and survey of "New York Harbor, N. Y., with a view to securing additional width in Bay Ridge and Red Hook Channels," as called for by the river and harbor act of March 4, 1913, was published as House Document No. 863, Sixty-third Congress, second session. In this report it was recommended that the triangular area at the junction of Red Hook and Bay Ridge Channels, indicated on the acocmpanying map as "A," be dredged to a depth of 40 feet at mean low water, the reason for such provision being that additional width was required for maneuvering large ships approaching or leaving the piers in that vicinity. The estimated cost was $920,000. It will be noted that this project involves the removal to a depth of 40 feet of a portion of the shoal now under consideration.

BRIDGES, TERMINAL FACILITIES, ETC.

12. No matters relative to bridges, terminal facilities, water power, land reclamation, etc., are considered as pertinent to this examination.

WISHES OF INTERESTED PARTIES.

13. A public hearing was held on June 2 with a view to obtaining the wishes of interested parties and with a view to determining the

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facts upon which such wishes were based. Notices were sent to 34 parties, and a memorandum of the substance of remarks made at the hearing is inclosed. Full stenographic notes were not taken, but the substance of what was said was noted at the time.

14. Those present were of the opinion that the removal of the shoal in question should be made by sections. Attention was called to the fact that two projects for removing portions of this shoal had already been recommended to Congress, but had not been adopted.

15. It was the opinion of those present that sections of the shoal should be removed in the following order:

First. Increase the width of Bay Ridge and Red Hook Channels near the point of their junction in accordance with the project described in House Document No. 863, Sixty-third Congress, second session.

Second. Remove a portion of the westerly part of the shoal to provide a channel 40 feet in depth and 2,000 feet in width as an extension of Ambrose Channel, in accordance with the project described in House Document No. 518, Sixty-third Congress, second session.

Third. Remove to a depth of 40 feet that portion of the shoal not covered by the second item and lying south of a straight line from the Sixty-fifth Street Pier, Brooklyn, to the Municipal Ferry, St. George, Staten Island. The amount of material to be removed is roughly estimated by this office as 12,300,000 cubic yards.

Fourth. Provide an anchorage ground 25 feet in depth and 2,500 feet in width on the easterly side of the proposed extension of Ambrose Channel. The amount of material to be removed is roughly estimated by this office as 4,800,000 cubic yards.

Mr. Eugene F. Moran, chairman committee on rivers and harbors of the New York Maritime Exchange, agreed at the time of the meeting to the above order for carrying out the work. On June 14, however, he wrote this office, recommending that the project for extending Ambrose Channel (B) be carried out in advance of the project for widening Bay Ridge and Red Hook Channels (A). A copy of this letter[1] is inclosed.

16. The first of these items was stated to be urgent because of the existence of large piers in the vicinity of the junction between Red Hook and Bay Ridge Channels, because of the probable early construction in this vicinity of additional piers, the longest within the city limits, and because a barge terminal for the New York State canals was under construction in that vicinity. These conditions were said to render necessary a larger area than is now available for maneuvering large ships.

17. The reasons for the second item have not changed in character since the project was recommended, but the need for the work appears to be greater now than at the time the report was submitted.

18. The third item was urged to enable vessels proceeding from the quarantine-anchorage ground to Bay Ridge and Red Hook Channels to follow a shorter route and to facilitate the movement of large vessels from the Brooklyn water front to the New York water front. The fourth item was urged on the ground that the present anchorage areas for vessels of about 23 feet draft are now insufficient, and that congestion will increase in the future for vessels of that general character.

[1] Not printed.

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PRESENT AND PROSPECTIVE DEMANDS OF COMMERCE.

19. The commerce that might be somewhat facilitated by the removal of this entire shoal to 40 feet at mean low water, as the wording of the act would seem to contemplate, constitutes a considerable percentage of the total commerce of New York Harbor. It includes foreign and coastwise trade and harbor traffic and is general in character. This commerce may be divided into several classes, of which the relative importance seems to me to be logically as follows:

(*a*) Traffic by barges and lighters between the Brooklyn water front and other parts of New York Harbor. This traffic would be benefited because such craft could take shorter routes than at present and would be less delayed and endangered by congestion which now exists at certain points.

(*b*) Traffic by steamships and sailing vessels which use the piers along the Brooklyn water front. This traffic would be facilitated by having increased room in which to maneuver while docking and undocking, and in some cases would follow more direct routes to or from the piers.

(*c*) An increase in anchorage areas would be of advantage to many different kinds of commerce.

20. Traffic by barges and lighters, covered by subparagraph (*a*), does not require a depth greater than 18 feet. No request has been received for deeper water for this class of traffic, and its representatives offered no objection to a suggestion made at the hearing that it might be advisable to leave a barrier of shoal water between the suggested anchorage ground (area D on the inclosed map) and the channels along the Brooklyn water front. The discussion of this subject appears on page 11 (notes in regard to the public hearing). From what precedes it does not seem necessary at the present time to deepen the water overlying this shoal to increase the facilities for traffic by barges and lighters.

21. Maneuvering of vessels, covered by subparagraph (*b*), would be made less difficult by the widening of Bay Ridge and Red Hook Channels, projected in House Document No. 863, Sixty-third Congress, second session, which would sufficiently provide for those needs of the locality. This opinion was concurred in by those present at the hearing. To enable such vessels to take more direct routes to and from other parts of the harbor, however, those present advocated the removal of the southerly part of the existing middle ground (area C on the inclosed map).

22. Vessels drawing 30 feet or more leaving the quarantine anchorage at low water for points along the Brooklyn water front would have the distance shortened by about 1 mile if either area C or the entire shoal were removed to a depth of 40 feet. Ordinarily vessels drawing 24 feet would be benefited to the same extent, as they usually follow the same route as the deeper-draft vessels.

23. Vessels drawing 30 feet passing from Kill von Kull to Brooklyn would have the distance shortened by about 2¼ miles if the southerly portion of the shoal (area C) were removed, and vessels of that draft from points on the North River and the East River would profit to the same extent. No large number of vessels drawing 30 feet make the above trips. Vessels drawing 25 feet or less and plying between points on the North or East Rivers and the Brooklyn water front are now able to use Buttermilk Channel, and probably under no circumstances would pass around the southern end of

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the shoal in Gowanus Bay. No definite data are available as to the number of vessels visiting points on Bay Ridge or Red Hook Channels that would be benefited by the suggested improvement. It is believed that the greater proportion of these vessels draw less than 24 feet. Vessels drawing more than that would ordinarily go direct from the piers on the Brooklyn water front to the ocean, using the existing 40-foot channel. Vessels inward bound would have to make something of a detour between the quarantine anchorage and the south end of Bay Ridge Channel.

24. If the shoal be deepened and used as an anchorage ground, free passage of vessels across its area will be obstructed by vessels and barges at anchor. Increased accessibility of the Brooklyn water front is negatived by plans to convert this area into an anchorage ground.

25. The removal of the entire shoal in Gowanus Bay to a depth of 40 feet or the removal of its southerly end to that depth (area C on the inclosed map), as advocated at the hearing, is not believed to be justified by any corresponding increase now or in the future to the accessibility of the Brooklyn water front.

26. The removal of the entire shoal to a depth of 40 feet to provide additional anchorage ground was not seriously advocated by any of those present at the public hearing; on the contrary, it was recognized that the cost would be so great as to be prohibitive, but it was urged that an area 2,500 feet in width and adjoining the easterly edge of the extension of Ambrose Channel as proposed in House Document No. 518, Sixty-third Congress, second session, be dredged to a depth of 25 feet to serve as an increased anchorage ground and that a barrier of comparatively shoal water be left between such anchorage area and the channels along the Brooklyn water front to prevent vessels at anchor from swinging into the channel.

27. Provision for increasing anchorage areas in New York Harbor may become necessary in the near future, but the work proposed at the public hearing to provide additional anchorage ground in Gowanus Bay should not be undertaken at this time. If additional anchorage areas be necessary, a general investigation of the subject should be made, and the best locations and methods of obtaining such additional areas should be determined. Such an investigation might well show that additional anchorage facilities could be provided at less expense and to better effect than by the project proposed at the hearing. Many vessels of considerable draft and barges actually anchor at the present time over parts of this shoal. If additional anchorage areas for vessels drawing 23 feet or more be required, it is possible that rules requiring shallow draft vessels to anchor in shallow water, leaving the deeper water available for larger craft, might provide sufficient anchorage areas for the present for both shallow draft vessels and vessels drawing up to 23 feet.

28. In my opinion the locality is worthy of improvement to the extent already recommended, and for the reasons given in House Documents Nos. 518 and 863, Sixty-third Congress, second session. It is also my opinion that further improvement of this locality will be justifiable, if at all, only after the above projects have been completed, or so nearly completed that their results are known.

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29. The maximum draft of vessels that might traverse the area in question, if dredged to 40 feet, is about 37 feet; very few of such vessels would draw more than 33 feet.

FREDERIC V. ABBOT,
Colonel, Corps of Engineers.

[First indorsement.]

OFFICE OF DIVISION ENGINEER, EASTERN DIVISION,
New York City, June 26, 1915.

To the Chief of Engineers, concurring in the views of the district engineer officer.

W. M. BLACK,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

MEMORANDUM OF THE SUBSTANCE OF REMARKS MADE AT A PUBLIC HEARING IN REGARD TO PRELIMINARY EXAMINATION OF NEW YORK HARBOR, N. Y., WITH A VIEW TO REMOVING THE SHOAL IN GOWANUS BAY TO A DEPTH UNIFORM WITH BAY-RIDGE CHANNEL.

The meeting was called in accordance with the following notice:

"The river and harbor act of March 4, 1915, directed an examination of New York Harbor 'with a view to removing the shoal in Gowanus Bay to a depth uniform with Bay Ridge Channel.'

"A public hearing on this subject will be held in room 407, Army Building, 39 Whitehall Street, New York City, at 2 p. m., June 2, 1915. Interested persons are invited to attend and to express their views upon the desirability and importance of removing this shoal.

"FREDERIC V. ABBOT.
"*Colonel, Corps of Engineers.*"

The following parties in interest were present: R. A. C. Smith, commissioner of docks and ferries, New York City; F. S. Gardner, president New York City Board of Trade and Transportation; W. Fred Silleck, president Erie Basin Board of Trade; William O'Donnell, E. G. Kohnstumm, members Erie Basin Board of Trade; G. W. Tillson, consulting engineer to president of Borough of Brooklyn; Mr. Talbot, resident engineer, State Barge Canal terminal; Eugene Moran, chairman committee on rivers and harbors of New York Maritime Exchange; Capt. K. Schwaiger, Brooklyn superintendent Humburg-American piers; J. Hageman, assistant superintendent Hamburg-American piers; C. E. Trout, engineer, New York dock department; S. B. Crittenden, of Brooklyn (no official capacity).

Col. Abbot called the meeting to order and stated that the object was to enable him to submit a report in accordance with the item in the river and harbor act of March 4, 1915, calling for an examination and survey of "New York Harbor, N. Y., with a view to the removal of the shoal in Gowanus Bay." Col. Abbot stated that he had invited people in interest to be present and to express their opinions with a view to determining what should be done, if anything.

Mr. Eugene F. Moran stated that he represented the Maritime Association of the Port of New York, who had gone into the matter very fully. They had communicated with the steamship people, who have been using that channel from the time it was first built. They appreciated the fact that to remove that entire shoal is going to cost an enormous amount of money, and after interviewing and writing to a number of steamship people who go in and out of there they came to the conclusion that the conditions there would be remedied a great deal at the present time and in the immediate future by taking off the southerly end of the shoal to a line connecting Bay Ridge Avenue Dock, or a little bit to the north of it, with Robbins Reef. * * * He stated that during the last few months the westerly anchorage has been so crowded that shallow-draft ships have had to use the eastern anchorage; * * * that anchorage for barges

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was required. * * * He advocated dredging the southern end to a depth of 40 feet, and the balance to 25 feet.

* * * * * * *

Referring to a question in regard to the triangular area at the junction of Bay Ridge and Red Hook Channels (marked "A"), Col. Abbot stated that this was a project that has never been adopted by Congress, although it had been recommended by the War Department. Inasmuch as the project for dredging this area had not been taken up as yet by Congress, this subject might properly be considered by those present.

* * * * * * *

Mr. Moran stated that in making his recommendation he assumed that the triangular area would be dredged out to 40 feet. What he recommended was supplementary to that project.

Ships now using the westerly anchorage while in ballast sometimes draw 18 to 20 feet. Mr. Moran's idea was that if at any time in the future it should be necessary to remove the shoal to a greater depth than he now advocated, the work now proposed would be in line with such future extension.

Mr. R. A. C. Smith stated that it was very essential to have the triangular space "A" dredged as projected. He based his argument on the existence of many large piers in that vicinity and the fact that additional piers would be built there in the near future.

Maj. Dent pointed out the location of the proposed extension of Ambrose Channel opposite the anchorage ground "B" and called attention to the fact that that project was now in identically the same condition as the project for the triangular area "A," which had been recommended to Congress but had not been adopted by Congress, although it was once included in a river and harbor bill which passed the House of Representatives and failed in the Senate.

Col. Abbot asked if it was the idea of those present that all of the shoal to the south of the line connecting Bay Ridge Avenue and Robbins Reef Light should be removed to a depth of 40 feet and become a part of the main fairway of the harbor, and that to the north of that line the shoal should be removed to a sufficient depth to enable it to be used as an anchorage ground for vessels drawing 20 to 22 feet.

Commissioner Smith stated that, in the interest of the harbor, he thought it well to concentrate and secure from Congress the removal of the triangular area "A" and the widening of the main channel "B." He stated that this would largely remove the objections that had been brought out in reference to the present anchorage area.

Col. Abbot called attention to the fact that they were advocating the removal of still another large yardage of material from the shoal in question, whereas Congress had not yet appropriated funds for the removal of parts already recommended for removal. He asked whether it was considered more important to dredge the entire shoal to 25 feet than to dredge the areas "A" and "B" to 40 feet, as already recommended to Congress.

Mr. Moran stated that all the trouble in the grounding of big ships using Bush Terminal Docks has been due to grounding south of the Bay Ridge Avenue—Robbins Reef Light line.

Col. Abbot asked whether there was any objection to having anchorage in front of the deep-water channel leading to the Bush Terminal Piers and the proposed municipal piers.

Mr. Moran stated that such an anchorage would be objectionable. He also stated that a 400-foot ship in the proposed anchorage, with 900 feet of chain out, might swing across the channel and that this could not be permitted. Mr. Moran said that to dredge the portion of the shoal south of the line between the Sixty-fifth Street docks and the municipal ferry on Staten Island to 40 feet would possibly be better than the dredging he had already advocated south of the line from Bay Ridge Avenue Dock to Robbins Reef.

Dock Commissioner Smith stated that the order of importance in his mind of the several questions up was as follows:

"First, Remove the triangular area at the junction of Red Hook and Bay Ridge Channels according to the project already favorably reported to Congress. (H. Doc. No. 863, 63d Cong., 2d sess.)

"Second. Widen the main channel, as laid down in the project already favorably reported to Congress, opposite the anchorage ground. (H. Doc. No. 518, 63d Cong., 2d, sess.)"

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(He called attention to the fact that this item had been included in the river and harbor act which passed the House of Representatives and failed in the Senate in the fall of 1914.)

"Third. Remove that portion of the shoal not covered by No. 2 lying to the southward of a straight line from Sixty-fifth Street to the municipal ferry at St. George."

The above order was indorsed by Mr. Frank S. Gardner, on behalf of the board of trade and transportation, and W. F. Silleck, president, Erie Basin Board of Trade. Mr. Talbot, resident engineer, New York Barge Canals, stated that he thought the State engineer would also indorse the same order. Mr. Tillson said that he thought the borough president of Brooklyn would also indorse the same order.

Commissioner Smith said that he liked the existence of a barrier between the channel along the Brooklyn water front and the anchorage ground to keep the boats actually at anchor from swinging so as to interfere with the use of the channel.

Commissioner Smith was specifically asked in regard to his views as to the advisability of having an anchorage ground immediately adjacent to a channel in front of the piers along the Brooklyn water front, and stated that he preferred to have a barrier of shoal water between the deep-water channel and the anchorage ground.

Mr. Moran stated that he had from his window counted 31 vessels about a week ago using the westerly anchorage at one time.

Commissioner Smith stated that this is an unusual condition, but that it actually requires the deep-draft vessels to give the westerly anchorage ground a wide berth, particularly during such times as a northwest wind swings vessels toward the channel. He cited the case of a vessel's having grounded due to the fact that during a westerly wind vessels at anchor west of the main channel had swung so as to seriously obstruct the channel.

Mr. Moran said that if a barrier of shoal water was left it could still be used as an anchorage for light-draft craft, canal boats, etc., drawing up to 6 or 8 feet.

He said that the fourth item in desirability would be to provide an anchorage 35 feet in depth and 2,500 feet in width on the easterly side of the proposed extension of Ambrose Channel.

This was indorsed by the same people as before. They want it completed in the order given, but they do not want partial completion of one item before the next item is taken up.

Mr. Frank S. Gardner stated that the object in requesting an examination and survey was to bring about a discussion such as they had had to-day with a view to determining the order in which the various parts of a project should be carried on, having in view the ultimate complete removal of the entire shoal at some future time.

LETTER OF TEBO YACHT BASIN CO.

BROOKLYN, N. Y., *July 14, 1915.*

GENTLEMEN: A communication of Frederic V. Abbot, colonel, Corps of Engineers, in re dredging the Gowanus Bay to the uniform depth with Bay Ridge Channel has been referred to me for attention, and as managing director of the Tebo Yacht Basin Co. the patrons of which make frequent and constant use of the Gowanus Bay, I desire to respectfully urge that this particular bay be deepened to the uniform depth with Bay Ridge Channel, not only for better accommodating the present traffic but also to make it possible for larger ships than may now use this Gowanus Bay to utilize docking facilities that would be provided for them by property owners on this Gowanus Bay. Your board is, of course, thoroughly familiar with the positive need for increasing the docking facilities in New York Harbor. On the Gowanus Bay, if properly deepened, many piers could be built and many large commercial ships accommodated at them which now have to remain at anchor in the open harbor.

My company would be one of the first to provide docking facilities for large ships if the Gowanus Bay were dredged to a proper depth for their safe use, and it is my judgment that dredging now under way in the Bay Ridge Channel should be continued or extended into Gowanus Bay.

Yours, respectfully,

THEODORE D. WELLS.

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

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LETTER OF AMERICAN ASSOCIATION OF MASTERS, MATES, AND PILOTS.

NEW YORK, N. Y., *July 2, 19*

GENTLEMEN: At the meeting held by this harbor on June 26 a circular l was read from F. V. Abbot, colonel, Corps of Engineers, wherein he rende unfavorable report "beyond such as has been already recommended to gress" as regards "New York Harbor, N. Y., with a view to removing the in Gowanus Bay to a depth uniform with Bay Ridge Channel.

The members of this harbor approve of Col. F. V. Abbot's report in every ticular. Besides the reason given by Col. Abbot, I am directed to state if the shoal should be removed to a uniform depth of the Bay Ridge Chan would make the conditions along the south Brooklyn water front far worse they are now, owing to the deepening of the water, which would undoub increase the force of the swell caused by the high wind from north to causing greater hardships to our men in performing their duties while do vessels of all descriptions, to say nothing of increased damage to flo property, which under the existing conditions, with the wind from nor west, are bad enough.

Respectfully,

J. J. SCULLY, *Secreta*

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 411.

HARBOR OF REFUGE AT SANDY BAY, CAPE ANN, MASS.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON REEXAMINATION OF HARBOR OF REFUGE AT SANDY BAY, CAPE ANN, MASS.

DECEMBER 16, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustrations.

WAR DEPARTMENT,
Washington, December 15, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated July 23, 1915, together with copies of reports from Col. W. E. Craighill and the Board of Engineers for Rivers and Harbors, dated June 21, 1915, and June 30, 1915, with maps, on reexamination of harbor of refuge at Sandy Bay, Cape Ann, Mass., made in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, July 23, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Reexamination of harbor of refuge at Sandy Bay, Cape Ann, Mass.

1. Under authority of section 14 of the river and harbor act approved March 4, 1915, there are submitted herewith for transmission

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to Congress report dated June 21, 1915, with maps, by Col. W. E. Craighill, Corps of Engineers, and report dated June 30, 1915, by the Board of Engineers for Rivers and Harbors, relative to the project for improvement of the harbor of refuge at Sandy Bay, Cape Ann, Mass.

2. The project for the construction of this harbor of refuge was adopted by Congress in 1884 without favorable recommendation by this department. It provides for a breakwater extending from Averys Ledge a little west of north 3,600 feet to Abners Ledge, thence 5,400 feet northwesterly in the direction of Andrews Point, protecting an area of about 1,377 acres. The original estimate of cost was $4,000,000, but this was subsequently increased to approximately $7,000,000. The total expenditures to date amount to about $2,000,000, leaving about $5,000,000 to be appropriated if the project is to be carried to completion. The district officer is of opinion that the benefits to be derived from completing this harbor of refuge are not sufficient to warrant the cost involved, and he therefore recommends the abandonment of the project. The division engineer and the Board of Engineers for Rivers and Harbors concur in this recommendation.

3. After due consideration of the above-mentioned reports I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore recommend that legislation be enacted authorizing the abandonment of the project for the construction of the harbor of refuge at Sandy Bay, Cape Ann, Mass.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
June 30, 1915.

TO THE CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. This report on Sandy Bay, Cape Ann, Mass., is submitted under authority of that portion of section 14 of the act of March 4, 1915, which reads, "and the Chief of Engineers is directed to make a report upon any other projects, river or harbor, the further improvement of which under present conditions is undesirable, or in which modifications of the plans or projects should be made."

2. The project for a harbor of refuge at this locality was adopted in 1884 and provides for a breakwater extending from Averys Ledge, a little west of north 3,600 feet to Abners Ledge, thence 5,400 feet northwesterly in the direction of Andrews Point, covering an area of about 1,377 acres, the original estimate of cost being $4,000,000, subsequently increased to approximately $7,000,000. Work has progressed slowly under small appropriations since 1886, with a total expenditure of about $2,000,000. The substructure has been completed to about mean low water for the full length of the southern arm and for about 2,500 feet on the western arm, and about 201 feet of the superstructure on the western arm and 600 feet on the southern

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arm have been completed. This leaves about $5,000,000 to be appropriated for construction, if the project is to be carried to completion, and an unknown amount for maintenance.

3. The district officer is of opinion that the benefits to be derived from this harbor of refuge are not sufficient to justify the cost involved, and therefore he recommends that the project be abandoned. The division engineer concurs in this view.

4. Attention is invited to the history of this project as briefly outlined by the district officer. The first report called for by the act of August 2, 1882, contained a plan and estimate of cost, but no recommendation as to the worthiness of the improvement. Subsequently in 1884, a board of engineer officers stated that a national harbor of refuge of the first class as contemplated by the act was not considered necessary or expedient, but that if Congress should decide otherwise, the location selected was the best. Later, after a favorable communication from the Secretary of War, the work was begun.

The question now under consideration is whether the project shall be modified or abandoned. The work was undertaken for the purpose of providing a refuge for passing vessels. It was at a time when there was much greater need for such a harbor than at present. The great majority of coasting vessels then were small or moderate sized sailing vessels, which in stress of weather would gladly seek such a shelter. These vessels have been largely superseded by stanch steamers. The time between ports is less than in former years and better advice regarding weather conditions is available at every harbor. All these things tend to lessen the value and importance of a harbor of refuge as originally contemplated. The cost of completing the project is believed to be far in excess of the probable resulting benefits, and therefore the board concurs with the district officer and the division engineer and recommends that legislation be enacted authorizing the abandonment of the project.

For the board:

W. M. Black,
Colonel, Corps of Engineers,
Senior Member of the Board.

REEXAMINATION OF HARBOR OF REFUGE AT SANDY BAY, CAPE ANN, MASS.

United States Engineer Office,
Boston, Mass., June 21, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Harbor of refuge at Sandy Bay, Cape Ann, Mass.

1. The following report on the project for harbor of refuge at Sandy Bay, Cape Ann, Mass., is submitted in accordance with indorsement of April 30, 1915, in pursuance of a provision in section 14 of the river and harbor act approved March 4, 1915, directing the Chief of Engineers to "report upon any * * * projects, river or harbor, the further improvement of which under present conditions

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is undesirable, or in which modifications of the plans or projects should be made."

2. Sandy Bay is at the northeastern extremity of Cape Ann; by water, about 9 miles northeast of the entrance to Gloucester Harbor, 23 miles north of Boston Harbor, and 24 miles south of Portsmouth Harbor.

3. Under date of November 28, 1883, Maj. Charles W. Raymond, Corps of Engineers, then in charge of this district, reported upon a survey made in pursuance of a provision in the river and harbor act of August 2, 1882, viz:

Sandy Bay, Rockport, Massachusetts, with a view to the construction of a breakwater for a harbor of refuge.

He submitted a project for a breakwater consisting of a mound of rubblestone with grade at 22 feet below mean low water, 40 feet wide on top, to be surmounted by a masonry wall, and to extend from Averys Ledge, a little west of north, 3,600 feet to Abners Ledge, thence 5,400 feet northwesterly in the direction of Andrews Point, covering an anchorage area within the limits of the 24-foot contour of 1,377 acres. The accompanying tracing, sheet No. 1, shows a plan of the breakwater and its general location. The estimated cost was placed at $4,000,000, but no recommendation as to the worthiness of the improvement was made.

The river and harbor act of July 5, 1884, appropriated $100,000 for—

Constructing a national harbor of refuge of the first class at Sandy Bay, Cape Ann, Massachusetts, * * * *Provided*, That a board of three engineers, to be appointed by the Secretary of War, shall decide that this point is the best location on the coast between Boston and Portland for such a harbor that shall serve all the uses for which it may be needed.

Under this provision a Board of Engineers was appointed July 28, 1884, and submitted reports dated August 22, 1884, and November 20, 1884. The decision of the board was that Sandy Bay was the best location on the coast between Boston and Portland for a harbor of refuge of the first class, and also that the plans for the breakwater recommended by Maj. Raymond were the best that could be adopted. It increased the estimated cost from $4,000,000 to $5,000,000 and stated that $2,500,000 additional would be necessary for lighthouses, buoys, etc., and for defending the harbor. It also reached the following conclusions:

It is not considered necessary or expedient at this time to construct "a national harbor of refuge of the first class" at any point "between Boston and Portland." Should Congress decide otherwise the board is of the opinion that Sandy Bay "is the best place" for such a harbor between Boston and Portland. If Sandy Bay be occupied and the area of the harbor be made as great as proposed by Maj. Raymond the lines selected by him for the breakwater seem the best.

It appears on page 581 of the annual report of the Chief of Engineers for 1886 that—

On April 15, 1885, interested parties asked the honorable the Secretary of War to direct operations to be commenced. They stated that the expenditure of the sum available would more clearly mark Avery's Ledge, which would be "a very substantial benefit to commerce," and if more funds were provided "one end of the breakwater would be already completed."

The subject was referred to the local engineer, who stated that the construction of a pier on the ledge, "extending above high water, would, without doubt, be a benefit to navigation, whether a breakwater is or is not built in the future,"

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and on July 6, 1885, the work of building a pier to mark the site of the ledge, as well as to form one terminus of the proposed breakwater, was authorized.

In response to Senate resolution of April 8, 1886, viz:

Resolved, That the Secretary of War be directed to inform the Senate what progress has been made in the construction of the harbor of refuge at Sandy Bay, near Cape Ann, Massachusetts; also such facts and considerations as he may deem important as affecting the question of the expediency of completing the same,

the then Secretary of War, Mr. Endicott, reported that—

In view of the action of Congress in 1884 and the evidence accompanying this letter, and also in view of the great dangers to navigation at this point upon our coast, to which all persons engaged in shipping and commerce have long borne testimony, I am of opinion that it is wise and expedient, by reasonable annual appropriations, to continue and complete this work.

With appropriations ranging from $100,000 to $150,000, in each river and harbor act, the work on the substructure then proceeded without any change of note until the passage of the river and harbor act of March 3, 1899, which appropriated $250,000, with a provision that—

the Secretary of War shall appoint a board of three engineers whose duty it shall be to examine said project and report whether any modification of the same should, in their judgment, be made, with an estimate of the cost of completing the same.

The board reported on July 3, 1899, that no changes were required in either the alignment, cross section, or method of construction of the substructure, and on February 13, 1900, submitted a further report (H. Doc. No. 453, 56th Cong., 1st sess.), proposing a modified type of superstructure (see cross section A on sheet 2 herewith), and submitting a revised estimate for a project amounting to a total, including previous work, of $6,904,952.25, and recommended the commencement of superstructure on the older part of the substructure. This project, so far as length and general location of the breakwater are concerned, is the existing project, but the locality is so exposed to extreme storm conditions that as the work progressed it was found necessary to increase the width of base and to modify the character of the superstructure. In 1908 a section 97 feet in length of the type of superstructure proposed by the board of 1900, very slightly modified, was built, but the winter storms of 1908 and 1909 proved this cross section to be insufficient and a further modification was made under authority of the War Department (cross section B of sheet 2 herewith). With appropriations ranging from $25,000 to $200,000, work has been continued up to the present time, the total appropriations to date being, with receipts from other sources, $1,950,001, of which an unexpended balance of approximately $73,000 is on hand covered by an existing contract.

4. *Work already done.*—In general terms the substructure has been completed to about mean low water for the full length of the southern arm and for about 2,500 feet on the western arm, as shown on profile, sheet 2, and cross section C, sheet 2. Starting at the intersection of the southern and western arms, about 201 feet of superstructure have been completed on the western arm and 600 feet on the southern arm, as shown on profile, sheet 2, and cross section B, sheet 2. Under an existing contract, it is expected to complete, with the expenditure of

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the funds now available, about 125 feet of additional superstructure on the southern arm, making a total length of about 926 feet of superstructure. Up to the present time a total of 2,101,079 tons of rubble-stone and 32,655 tons of dimension stone, have been placed in the breakwater.

5. *Navigable extent.*—The easterly entrance between Averys Ledge and Straitsmouth Island has a good navigable channel of about 30 feet depth at mean low water, and the northerly entrance off Andrews Point a channel of 75 to 90 feet depth at mean low water. The harbor has an anchorage area of 1,377 acres within the 24-foot contour and about 1,184 acres within the 42-foot contour. Examinations of the bottom show it to be good holding ground for anchorage.

6. *Maximum draft that can be carried at mean low water.*—A draft of 28 feet can be carried at mean low water with safety in the easterly entrance, and there is ample depth for the largest vessels in the northerly entrance and in the anchorage area behind the site of the breakwater.

7. *Rise and fall of water surface.*—The range of spring tides at Sandy Bay is 10.1 feet, of neap tides is 7.5 feet, and of mean tides is 8.8 feet.

8. *Unusual difficulties of navigation.*—The coast in this locality is bold and rocky. Seaward of the southern arm of the breakwater is a chain of flats and ledges known as Averys Ledge, Little Salvages, Dry Salvages, and the Flat Ground, which make the approach to the easterly entrance dangerous at night or in thick weather. Maj. Raymond said in his report of November 28, 1883, above cited:

> The proposed harbor will have great accessibility in the daytime in weather when the adjacent coast can be seen. In the night and in thick weather, when the lights are obscured, it is a serious question whether an attempt to enter it could be made with safety. At the northern entrance a slight error would bring the ship upon the rocky shore. At the eastern there would always be danger from the outlying reefs and ledges. Whether under such circumstances it would be more desirable for the sailor to risk an attempt to enter the harbor than to stand out to sea is a question upon which the opinion of those skilled in navigation is of more value than my own.

I think it would be doubtful if a navigator would attempt to enter the harbor in thick weather for safety, as a failure to make the entrance would probably result in disaster.

9. *Terminals.*—The breakwater is designed for a harbor of refuge only, and the question of terminals is perhaps not material for the purposes of this report, but contiguous to the breakwater and to some extent sheltered by it are Rockport Harbor, Knowltons Harbor, Rockport Granite Co.'s harbor, Pigeon Hill Granite Co.'s harbor, and Pigeon Cove Harbor. Rockport Harbor has three granite wharves suitable for loading and unloading stone, fish, coal, and lumber. Small quantities of these supplies are received there for local consumption. Knowltons Harbor is of very small capacity and used principally for an anchorage for lobster cars. Rockport Granite Co.'s harbor and Pigeon Hill Granite Co.'s harbor, so called, are owned by the Rockport Granite Co. and used for the shipment of stone from its quarries. These two harbors are basins, each formed by a breakwater and pier of granite blocks, and each is provided with derrick equipment for handling stone up to 30 tons in weight. Pigeon Cove Harbor is a basin formed by a natural

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indentation in the rocky shore, nearly closed at the mouth by a heavy breakwater of granite blocks. It is provided with fair equipment for loading stone and other materials. The harbor is owned by the Rockport Harbor Corporation, but presumably the piers are open to all on equal terms. There is no physical connection between any of these wharves and the nearest railroad. Reasonably good roads connect the wharves with the public highways, and the water terminals are adequate for supplying the needs of the locality. For more detailed description of terminals and transfer facilities of these harbors, see page 88, House Document No. 226, Sixty-third Congress, first session.

10. *Commerce.*—As the breakwater is designed for a harbor of refuge only, no definite statements can be given as to the commerce affected. Various estimates have been made as to the number of vessels passing in the vicinity, some placing the number of all kinds as high as 70,000 annually. The commerce of the local harbors mentioned above consists principally of shipments of stone from the granite quarries and the receipt of coal, lumber, oil, and other supplies consumed locally. This commerce is negligible so far as the breakwater project is concerned.

11. *Worthy or not worthy of completion.*—Recent annual reports from this office have contained substantially the following remarks relative to worthiness:

> The work already done has resulted in the creation of a serious menace to navigation until the submerged substructure is protected and made visible by a suitable superstructure. Under these conditions the district officer is of the opinion that the locality is worthy of improvement to the extent of completing the superstructure for the full length of the present substructure at least. When this has been accomplished the advisability of completing the structure to its full projected length can be taken up with more satisfactory data on which to base recommendations.

As will be seen from the above, the estimated cost of the project is in round numbers $7,000,000, of which nearly $2,000,000 have been appropriated, leaving about $5,000,000 required for completing the structure alone, aside from any cost of lighthouses, the defense of the harbor, or of maintenance. It does not appear that any estimate of the cost of maintenance has ever been made, but from my observations of the effect of unusual storms on the completed work thus far a considerable amount annually would be required for maintenance. The anchorage behind so much of the breakwater as has been built affords some protection to vessels, but it is very little used. The substructure on which superstructure has not been built serves to some extent to break the heavy roll of the sea as do reefs and shoals behind which navigators sometimes seek anchorage in stress of weather.

After several inspections of the breakwater and upon further consideration I have come to the conclusion that the dangers to navigation due to leaving the work in its present condition are not such as to warrant the great expenditure necessary to complete it; neither would the benefits to be derived by navigation interests be commensurate with the cost involved. Consequently, in my opinion, the project should be abandoned. If this be done, the proper buoyage and lighting of the structure would seem to be a subject for consideration of the Lighthouse Bureau. For the present the structure seems sufficiently marked by the existing lights and buoys, which for

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the easterly entrance consist of a lighthouse on Straitsmouth Island, on the south side of the channel, and a bell buoy on the north side on Averys Ledge, and at the northerly entrance of a gas buoy at the end of the existing substructure. The angle I think is sufficiently marked by the existing 801 feet in length of superstructure, standing 22 feet above mean low water.

W. E. CRAIGHILL,
Colonel, Corps of Engineers.

[First indorsement.]

THE DIVISION ENGINEER, NORTHEAST DIVISION,
New York City, June 22, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

Forwarded, concurring in the opinion of the district engineer officer.

FREDERIC V. ABBOT,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for River and Harbors see p. 2.]

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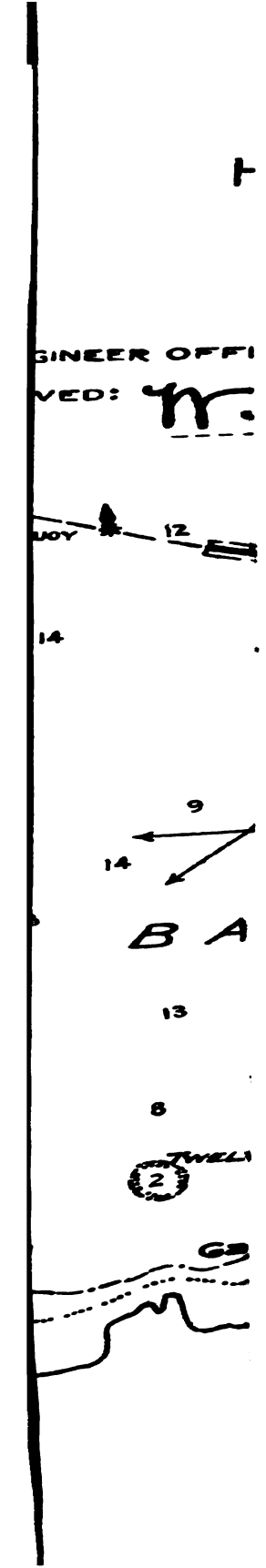

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 412.

CANE RIVER, LA.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF CANE RIVER, LA., FROM GRAND ECORE TO COLFAX.

DECEMBER 16, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 15, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated August 19, 1915, together with copy of a report from Maj. J. R. Slattery, Corps of Engineers, dated June 18, 1915, with map, on preliminary examination of Cane River, La., from Grand Ecore to Colfax, made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, August 19, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Cane River, La., from Grand Ecore to Colfax.

1. There is submitted herewith for transmission to Congress report dated June 18, 1915, with map, by Maj. J. R. Slattery, Corps of

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Engineers, on preliminary examination of Cane River, La., from Grand Ecore to Colfax, called for by the river and harbor act approved March 4, 1915.

2. Cane River is an old bed of the Red River, leaving the present course of the latter at Grand Ecore and joining it again at Colfax, its total length being about 75 miles. It is navigable only at high stages on the Red River. The district officer states that practically no use is made either of Cane or Red River in this vicinity for transportation purposes and there is no great demand for the improvement of the river in the interests of navigation. To secure a navigable chanel in Cane River would involve the construction of several locks and dams at considerable cost. In view of the facts developed by the preliminary examination, the district officer expresses the opinion that this stream is not worthy of improvement by the United States. In this opinion the division engineer concurs.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith. dated July 27, 1915, concurring in the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Cane River, La., from Grand Ecore to Colfax is not deemed advisable at the present time.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
July 27, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is submitted in review of the district officer's report on preliminary examination of Cane River, La., from Grand Ecore to Colfax, called for by the act of March 4, 1915.

2. The Cane River is an old bed of the Red River, which it leaves at Grand Ecore and joins again at Colfax. Its length is about 75 miles. The river has filled until at low stages it is practically dry in places, and it can be navigated only at high stages. There is at present no commerce or navigation on the stream and little or no demand for any. Several forms of improvement have been suggested by residents of the locality, mainly to secure benefits having little or no relation to commerce or navigation. The district officer reports the stream as unworthy of improvement, and the division engineer concurs in this view.

3. The usual notice of unfavorable report was sent to interested parties, resulting in some correspondence[1] with Hon. J. B. Aswell, M. C., from which it appears that local interests wish to close the

[1] Not printed.

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river in two places at their own expense, and that all they will ask of the Federal Government is the approval of their plans when perfected.

4. This stream is not navigable in its present condition, and can be made so only by extensive work involving a high cost. There is no traffic on the Red River in this vicinity, and it appears that there is no demand for improvement of the Cane River with the expectation of using it for navigation. The board reports, therefore, in concurrence with the views of the district officer and the division engineer, that in its opinion it is not advisable for the United States to undertake the improvement of the Cane River, La.

5. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other subjects which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

PRELIMINARY EXAMINATION OF CANE RIVER, LA.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Vicksburg, Miss., June 18, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Preliminary examination of Cane River, La.

1. The river and harbor act approved March 4, 1915, provides for the preliminary examination of Cane River, La., from Grand Ecore to Colfax. The duty of making this examination was assigned to the undersigned by department letter dated March 15, 1915, and report is accordingly submitted.

2. Cane River is an old bed of the Red River. From Grand Ecore, where it leaves, to Colfax, where it rejoins the main channel of the Red, its length is about 75 miles. Its banks are high. Its bed has gradually filled until now no water from the Red enters its upper end until there is about a 16-foot stage in the Red, and boats drawing over 4 feet are unable to enter the lower end until there is a stage of about 20 feet in the Red at Alexandria. When the Red is at low stage Cane River in its upper reaches consists usually of a series of pools, separated by dry or practically dry bars; in its lower reaches there is always a shallow channel, due to backwater from the Red and the flow from the Kesatchie swamps, but altogether inadequate for transportation purposes. Low-water stages generally occur during the summer and fall, the period when the crop movement occurs. High-water stages may be expected in the winter and spring, when no crops are moving. The extreme variation between high and low stages is about 35 feet, with an average variation of probably 27 or 28 feet.

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3. The following table gives the bridges across the stream:

Location.	Type.	Clearance.	Headroom at boating stage.
		Feet.	*Feet.*
Natchitoches	Draw	90	.....
Bermuda	Fixed	92	18
Derry	Draw	90	.....
Chopin	Fixed	93	22
Marco	.....do.....	93	24

4. Preliminary examinations were previously made in 1882 and 1891. Reports on these examinations may be found in the reports of the Chief of Engineers for 1884 and 1891, pages 1366 and 2022, respectively. Both reports were unfavorable.

5. Between Cane River and Red River there is an exceedingly fertile island, approximately 30 miles long, with an average width of possibly 4 miles. Cotton is the principal crop, although hay and corn are also raised. Approximately 150,000 bales (37,500 tons) of cotton, 75,000 tons of cotton seed, and 5,000 tons of hay are produced annually and shipped by rail to Shreveport, Natchitoches, and Alexandria. Practically no use is made either of Cane or Red River for transportation purposes, although a fairly good 3-foot channel is available most of the year in the Red from Grand Ecore to Alexandria, and practically all the year from Montgomery to Alexandria. Some produce from the lower portion of the island is ferried across the Red to Colfax and shipped thence by rail. Natchitoches is the only town of any size on the river, but there are a number of small settlements.

6. There is no great demand for the improvement of Cane River in the interest of navigation. Residents along its lower and middle reaches expressed the opinion that if it were improved it might be useful in moving crops and in reducing freight rates on shipments by rail. The statement was also frequently made that the rather heavy loss of stock by bogging in the soft bottom and lower banks of Cane River would be materially lessened if a good depth of water were provided in the channel all the year round. In Natchitoches there was a strong demand for the absolute closure of the upper end of the river and for the construction of a dam some distance below the town, so as to form a clear-water pool in front of the town. There was no demand for a lock in this dam, and the aim of its advocates seemed to be the beautification of the attractive town of Natchitoches rather than the development of transportation facilities.

7. In order to secure a navigable channel in Cane River the construction of several locks and dams would be necessary. Such work would not only involve expenditures far beyond the amount warranted by existing commerce, but would also probably render the reclamation of the Kesatchie swamps—said to embrace about 405 square miles—much more difficult, if not impossible. The closure of the upper end of Cane River, its absolute abandonment as a navigable waterway, and the construction of a levee system from Grand Ecore along Red River to the lower end of Cane River Island would,

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on the other hand, facilitate the drainage of the Kesatchie swamps, effectually protect the greater part of the island from floods, and probably improve the channel of Red River between Grand Ecore and Colfax. In view of these facts, Cane River is believed to be unworthy of improvement by the United States.

8. There are no questions of water-power development or land reclamation that can be considered in conjunction with an improvement of this waterway in the interest of navigation other than outlined in the preceding paragraph.

9. A sketch map of the locality is submitted herewith.

J. R. SLATTERY,
Major, Corps of Engineers.

[First indorsement.]

OFFICE OF THE DIVISION ENGINEER, WESTERN DIVISON,
St. Louis, Mo., June 24, 1915.

TO THE CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. Forwarded.

2. In the opinion of the division engineer Cane River is unworthy of improvement by the General Government.

C. McD. TOWNSEND,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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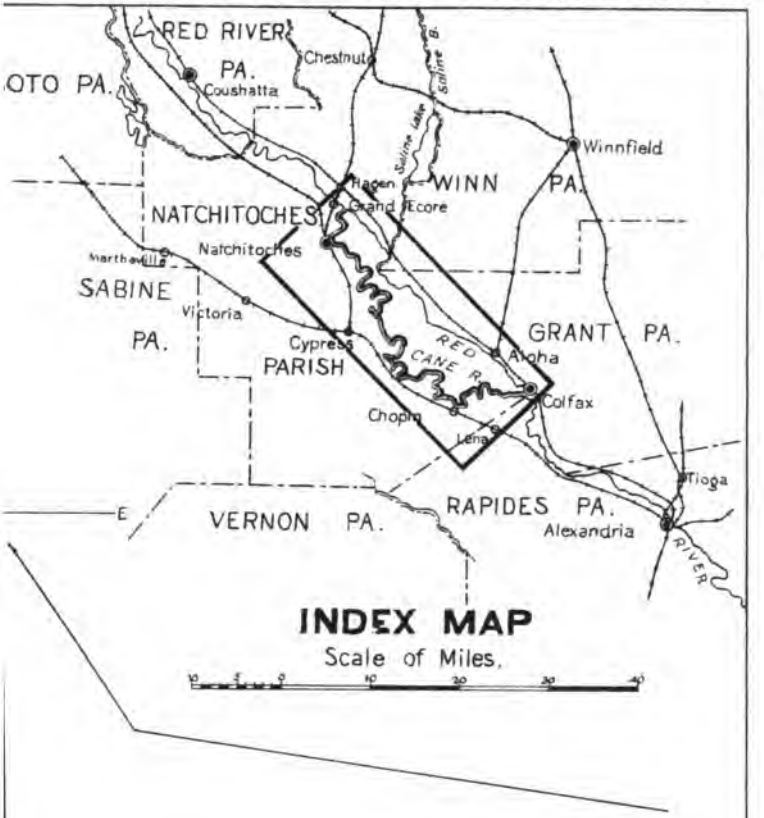
CORPS OF ENGINEERS, U. S. ARMY.



INDEX MAP

Scale of Miles.

Cane River, Louisiana,

which leaves Red River at Grand Ecore.

Made under the direction of
MAJOR J. R. SLATTERY,
CORPS OF ENGINEERS, U. S. A.

915.

Scale of Miles.

House Doc. No. ; 64th Cong., 1st Sess.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 413.

GULL LAKE RESERVOIR, MINN.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON REEXAMINATION OF GULL LAKE RESERVOIR, MINN.

DECEMBER 16, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 15, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated July 20, 1915, together with copies of reports from Lieut. Col. Chas. L. Potter, Corps of Engineers, and the Board of Engineers for Rivers and Harbors, dated September 11, 1913, November 14, 1913, and May 26, 1915, on reexamination of Gull Lake Reservoir, Minn., made in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, July 20, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Reexamination of Gull Lake Reservoir, Minn.

1. Section 14 of the river and harbor act approved March 4, 1915, calls for reexamination of a number of specified localities, with a view

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to obtaining reports whether the adopted projects shall be modified or the improvement abandoned, and further directs the Chief of Engineers "to make a report upon any other projects, river or harbor, the further improvement of which under present conditions is undesirable or in which modifications of the plans or projects should be made." Under this authority there are submitted herewith for transmission to Congress reports dated September 11, 1913, and November 14, 1913, by Lieut. Col. Chas. L. Potter, Corps of Engineers, and report dated May 26, 1915, by the Board of Engineers for Rivers and Harbors, relative to that part of the project for a reservoir at Gull Lake, Minn., which provides for the construction of ditches connecting Long, Round, and Gull Lakes.

2. The object of connecting these lakes was to increase the reservoir capacity of Gull Lake, but recent information indicates that this work will not appreciably affect the efficiency of the Gull Lake Reservoir, and that the estimate of cost of constructing the ditches must be increased from $12,998 to $54,100. The district officer reports that there is nothing to justify this expenditure as a part of the cost of Gull Lake Reservoir, and he recommends that this portion of the project be abandoned. The division engineer and the Board of Engineers for Rivers and Harbors concur in this opinion.

3. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore recommend that the proposed construction of ditches connecting Round Lake with Gull Lake and Long Lake with Round Lake be abandoned as part of the project for the construction of Gull Lake Reservoir, and that legislation be enacted authorizing the Secretary of War to surrender the flowage rights granted by private parties on Long Lake.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
May 26, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following report on Gull Lake Reservoir, Minn., is submitted under authority of the act of March 4, 1915, which provides, among other things, "and the Chief of Engineers is directed to make a report upon any other projects, river or harbor, the further improvement of which under present conditions is undesirable or in which modifications of the plans or projects should be made."

2. Attention is invited to letters from the district officer dated September 11, 1913, and November 14, 1913, for detailed information concerning the engineering features of this project. The object of the improvement described was to increase the reservoir capacity of Gull Lake by connecting it by means of ditches with Round and Long Lakes.

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3. It appears from the more recent information available that the former estimates were too low for the work contemplated, and also that additional work would be required. The district officer places the probable cost of the ditches at $54,100 instead of $12,998, an increase of $41,102. He states there is nothing to justify this expenditure in connection with the Gull Lake Reservoir, and therefore he recommends the abandonment of that portion of the project for Gull Lake Reservoir that provides for connecting it by means of ditches with Round and Long Lakes. The division engineer concurs in this recommendation.

4. The following is quoted from the annual report of the Chief of Engineers for 1914:

The act of March 2, 1907, authorized the construction of a reservoir at Gull Lake, Minn., at an estimated cost of $70,000, provided that the necessary land and flowage easements be acquired without cost to the United States. The estimate of cost was increased to $85,000 in 1912, and payment was authorized for right of way where necessary in the construction of ditches connecting Long, Round, and Gull Lakes. Investigations during the year indicate that the project can not be completed within the estimate, and that additional funds will be required, estimated at $45,000. A careful consideration shows that the advantages to this reservoir of connecting Round Lake to Gull Lake and Long Lake to Round Lake by ditches as a part of the original project are not sufficient to warrant the expenditure necessary, and it is recommended that this portion of the project be abandoned.

5. In view of all the circumstances now presented the board concurs in the opinion that the advantages to be gained by connecting these lakes by ditches as contemplated are not sufficient to justify the cost, and in the recommendation that this part of the Gull Lake project be abandoned. It is also recommended that suitable legislation be enacted authorizing the Secretary of War to surrender the flowage rights granted by private parties on Long Lake.

For the board:

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

REEXAMINATION OF GULL LAKE RESERVOIR, MINN.

UNITED STATES ENGINEER OFFICE,
St. Paul, Minn., September 11, 1913.

From: District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Gull Lake Reservoir.

1. The river and harbor act of March 2, 1907, provided:

For the construction of low reservoir dam at Gull Lake, Minnesota (project numbered one), and ditches between Gull Lake and Round Lake, and between Round Lake and Long Lake, Minnesota, seventy thousand dollars: *Provided*, That the land required for the construction of said Gull Lake Dam and Reservoir, together with any flowage rights which may be necessary, shall be ceded to the United States without charge.

At that time it was proposed to connect Gull Lake with Round Lake and Round Lake with Long Lake by enlarging the natural connections.

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2. Further consideration showed that the connection of Long to Round Lake by the natural waterway would be more expensive than a shorter ditch between the two lakes, even with the added expense of right of way for such a ditch. Owing to increased cost it was at the same time found that additional funds would be needed to complete the work. Attention is invited to letter[1] from this office dated September 30, 1911, to indorsements thereon and to two letters[1] of December 15, 1911, accompanying second indorsement—the last two being submitted through the division engineer.

3. As a result the river and harbor act of July 25, 1912, provided:

For completing construction of low reservoir dam at Gull Lake, Minnesota, provided for in the river and harbor act of March 2, 1907 (Thirty-fourth Statutes, page eleven hundred and five), fifteen thousand dollars, of which sum so much as may be necessary may be applied to the erection of dam-tender's dwelling and to the digging of necessary ditches between Gull Lake and Round Lake, and between Round Lake and Long Lake, including purchase of the rights of way needed in connection therewith, and construction of necessary bridges.

4. Not being satisfied with estimates, and being doubtful of conditions, I asked on February 3, 1913 (not through the division engineer), for authority to make a survey of Round and Long Lakes. This was approved February 18, 1913.

5. The survey was begun on March 11 on 4 feet of ice and completed on April 3, the ice being so far gone that a day's more work would have probably been impossible. The survey developed the fact that that portion of Long Lake which it is proposed to connect to Round Lake was at that time a separate lake of small area. The level of Gull Lake when full is 1,197 feet above sea level. That portion of Long Lake to be connected to Round Lake was 1,197.31, and the main portion of Long Lake was 1,197.63 in March, 1913. So with adequate ditches as planned no water could be drawn from Long Lake proper below a level of (estimated by the surveyor) 1,198. This is the level of the bottom of the natural outlet of Long Lake and it follows that without an additional ditch to connect the two parts of Long Lake, the larger part of Long Lake could furnish no more water nor storage than it does now. It will be noted that the smaller part of Long Lake, although farther from the outlet, is lower than the larger. This may be due to seepage of water from it direct to Round Lake or may be to the fact that, as soon as separation takes place the ratio of watershed to lake area is less in the smaller part and evaporation lowers the level faster than in the larger part.

6. On July 25, 1913, a party was sent to Long and Round Lakes to note conditions at that time. The rain gauge at Gull Lake Dam had recorded an excessive rainfall of 6.92 inches in the 30 days preceding July 23. It was thought that these conditions would be conducive to a high level of Long Lake and a fair discharge to Gull Lake from the two smaller lakes. It was found that Long Lake was at a level of 1,197.87—only 0.24 foot above what it was in March, 1913; that there was no outflow from this lake; and that there was an inflow from Gull to Round of 27 second-feet. Thus, at the time when these lakes should be expected to be extremely high and sending water into Gull Lake, one of them was receiving water from Gull Lake. But the data also showed strongly the shifting conditions in these lakes. The bar

[1] Not printed.

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between the two parts of Long Lake, which was estimated in March to be at a level of 1,198, and which certainly separated the two parts so that their levels were 1,197.31 and 1,197.63, respectively, had gone down to a level of 1,196.5 at the deepest point and showed a water section 210 feet wide and averaging nearly 1 foot in depth. It is probable that this was accomplished by winds. If such a change can occur in so short a time, it will appear that connecting channels must be protected.

7. In estimating the yardage to be excavated (letter of Dec. 15, 1911) the statement was made that the bottoms of the ditches were assumed to be 6 feet below flowage level. Flowage level is 1,197. The outlet of Round-Gull ditch shows in the plans 1,191, or 6 feet below flowage level. The inlet, however, shows a level of 1,193, and the same level appears at both the outlet and inlet of the Long-Round ditch. The ditches were to be dug to 1,191 and raised at the ends to 1,193, either to prevent their extreme extension into the lake, where deterioration would rapidly occur, or with the expectation that scour would occur to make the ditches effective. Little scour will probably occur, since the current through these ditches will be little or nothing except for a few days at a time at isolated intervals. If scour occurs vertically it certainly will occur laterally and the ditches will deteriorate rapidly. It is believed that little efficiency can be had from these ditches unless they be dug throughout to 1,191 and that, to obtain the full advantage of their construction, they should be dug below 1,191. This will call for an increase in yardage.

8. The land around these lakes is sandy to an extreme; the shores are sand and the lake beds generally sand, sometimes mixed with silt. The proposed ditches run out into the lakes on flat shores. The distances which the ditches project beyond high-water line into the lake at a level of 1,193 and for a level of 1,191—and they should undoubtedly be lower—is shown in the following table:

Ditch end.	Distance beyond high-water line.	
	Original estimate.	At level of 1,191.
	Feet.	*Feet.*
Into Gull Lake	150	150
Out of Round Lake	800	1,200
Into Round Lake	200	700
Out of Long Lake	115	350

For the protection of these channels extending into shallow lakes on a sandy shore with a perceptible current in them only a few days in the year no estimate is made. In the part through the dry ground both banks will be entirely of sand and yet no protection of the banks is provided, although apparently a scour is expected in a vertical direction to produce the stated depths. It is believed that, in order to maintain these channels, there will have to be much money expended or a heavy initial cost for protection. Regarding these features of the case, the district engineer's letter of September 30, 1911, states:

Owners of the lots wish concrete revetment walls along the canal, harbors, and landing places for boats in either lake, and assert that it was because of

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promises of the representatives of the United States that such work would be done that they contributed flowage rights for nothing.

In recent conversation with the two men who did more than any other to obtain flowage rights without cost to the Government, each stated that the people were promised that Gull Lake would be kept full and not drawn down until late in the fall, and not then until all other reservoirs were exhausted. But Gull Lake, being nearest to St. Paul, is most valuable as a reservoir for exactly the opposite purpose—to get water to St. Paul early in the low-water season when the river is falling rapidly and there is not time to get it from the great reservoirs at the head of the system. Either there has been serious misrepresentation made by some one or the people interested have vivid imaginations. The opposite picture to their expectations consists of crooked flat ditches full of sand with a trickling stream (or none at all) through them and their lake possibly drawn down until they will have hundreds of feet of sand and mud to cross before they can reach the water, and when reached it will be too shallow to float a boat until some distance out.

9. While it might, at first thought, appear that the estimate per yard (35 cents) is enough to pay for dredging and excavation, it will be seen to be small when it comes to analyze the conditions. The total estimated excavation is only 20,500 cubic yards. Every thousand dollars expended in building a dredge or moving one to the lake and away again taxes the 35 cents to the extent of about 5 cents. The dredged cuts are very shallow in some parts. In the table in paragraph 8 it will be seen that a difference in depth between 1,193 and 1,191 (2 feet) makes an additional length of 1,135 feet. Then at least 1,135 feet of cut will have an average depth of 1 foot, and to be made in the open lakes. A moderate-sized pump on a scow, costing only a few thousand dollars, could do the open-lake work, but to use such a plant against a bank 15 feet high with 1,000 feet of pipe would be very expensive. The ditching dredge quite common in this State could do the work between lakes, but it could not do the open-lake work. These do work for 12 or 13 cents and often less, but their contracts run into high figures in yardage. To move a dredge to and from the lake for 20,500 cubic yards would mean so much expense that there would probably be little or nothing left to pay for the work. The total estimate for the dredging is only $7,888. Enough must be taken from this to build a dredge—without prospect of future work unless the ditches are left without protection, in which case it will have work every year and must itself be maintained—or to transport, set up, dismantle, and ship away a portable dredge.

10. The estimate, therefore, appears inadequate for the following reasons:

(*a*) The estimated yardage is too small for efficient ditches.

(*b*) The price is too low for so small a work at so isolated a locality.

(*c*) Much protection will be needed to preserve the ditches, and none was provided.

(*d*) No estimate was made for maintenance. Without the protection mentioned (*c*), the maintenance will be expensive and with such protection the protection itself must be maintained.

(*e*) In order to get any efficiency from the connection of Long Lake to Round Lake, a ditch must be dug and maintained between the two parts of Long Lake and a bridge provided for the roadway across the lake at that point—now a trestle bridge.

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11. Having demonstrated the necessity of a revised estimate, going into much higher figures, the question arises, Is the work of enough importance to the reservoir to justify the expenditure of a greater amount of money? I think I can show that the advantages of connecting these lakes to Gull Lake by ditches is not worth anything like the present estimate, if it is worth anything at all. By not providing these ditches, in addition to saving their cost the United States will avoid owning and maintaining two bridges—three if we include the bridge or causeway across the strip of land (covered at high stages) between the two parts of Long Lake.

12. Gull Lake alone has a total capacity of 2,947,000,000 cubic feet. With the addition of Round and Long Lakes, its capacity was estimated to be 4,910,000,000. It is designed to discharge 500 second-feet for 100 days, amounting to 4,320,000,000. Before discharging that amount, however, its head would be so reduced that it could not keep up 500 second-feet. Its total capacity when completed is supposed to equal the runoff of the watershed for two years. The recent survey shows that Round Lake and Long Lake have somewhat less capacity (between 1,191 and 1,197 above sea level) than was estimated, and the revised figures from contour measurements are:

	Cubic feet.
Long Lake (east part)	1,100,000,000
Long Lake (west part)	161,000,000
Long Lake (total)	1,261,000,000
Round Lake	402,000,000
Gull Lake	2,947,000,000
Total reservoir when completed	4,610,000,000

ACCUMLATOR VALUE OF THESE LAKES.

13. A reservoir is valuable in proportion to its ability to accumulate water and to store it. To develop its storage capacity much beyond its accumulator capacity would be a poor investment. The watersheds of these small lakes are very limited as compared with the lake areas. Long Lake has an area of about 10 square miles and a watershed (exclusive of lake area) of about 18 square miles. It can therefore be expected to have little accumulator value, but this value appears much less than could be expected. The survey was begun in March, 1913, on 4 feet of ice. Between that time and the observation on July 25, all the precipitation since December, 1912, must have gone into Long Lake. This precipitation amounted to 17.51 inches, or nearly 2 inches above the normal. This raised the lake 2.88 inches (0.24 foot, see par. 6), and the water level did not reach the outlet, so there was no discharge other than possible percolation into Round Lake. Assuming that all precipitation between December 1, 1912, and March 31, 1913, blew entirely off the lake, there was between April 1 and July 25 a rainfall of 15.96 inches over the lake itself and it raised the lake only 2.88 inches. Evaporation has been variously estimated at from 25 to 34 inches in this locality. The pamphlet "Evaporation in the United States, Extract from the Monthly Weather Review for September, 1888," shows this locality to be about half way between the 30-inch and the 20-inch curves or at a point of 25-inch evaporation. Considering that the time between April 1 to July 25 is the season when the snows are melting and the rains are heaviest—a season when the atmosphere is more or less saturated

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with moisture—it would be unreasonable to expect half the annual evaporation to occur during those four months. If the actual rise of the lake between April 1 and July 25 (2.88 inches) be subtracted from the actual rainfall in that time over the lake alone (15.96 inches) it will show a loss of 13.08 inches, or more than one-half the annual evaporation, and this allows that it received nothing from 18.37 inches (actual precipitation plus snow blown from the lake) over the 18 square miles of its watershed. The only logical conclusion is that even if this lake gets no water from its 18 square miles of watershed—and it must get some—the annual evaporation must be more than 25 inches or there must be percolation into Round Lake. I am inclined to the latter belief. In any event a lake having no outlet except in very extreme rises and its outlet then running into Round and Gull Lakes can scarcely be figured as worth connecting with Round Lake by two expensive ditches crossed by highway bridges on the score of increased production of water to the reservoir.

14. Round Lake has less watershed, in proportion to its lake area, than has Long Lake. They are equal—2.5 square miles each. Being in the same sandy country as Long Lake its effect on supplying water to the reservoir would be expected to be less, and it proved so. On July 25, two days after the end of a month of 6.92 inches of rainfall, this lake was receiving 27 second feet from Gull Lake, instead of furnishing water to Gull Lake, as it should have done if it had any value in increasing the supply of water. This disposes of the accumulator value of Round Lake.

STORAGE VALUE.

15. Since it appears that neither of these lakes has an accumulator value, their only value to the reservoir, if they have any, must be for storage of water falling on the watershed and for which there may not be, under present conditions, sufficient storage capacity. If the present capacity is sufficient, why develop more?

16. On Aug. 31, 1913, there were completed two entire years of actual rainfall observations at Gull Lake Dam. Two following shows the results:

	Inches.
Sept. 1, 1911, to Aug. 31, 1912	29.11
Sept. 1, 1912, to Aug. 31, 1913	23.30
Total	52.41
Average	26.21

In order to arrive at the normal rainfall in the basin of this reservoir the average of the following stations has been taken:

Station.	Location with respect to Gull Lake Dam.	Number of years observations.	[illegible]
		Years.	*Inches.*
Pine River Dam	N. 33°, 21 miles	25	678.77
Fort Ripley	S., 17 miles	12	260.69
Brainerd	S. 68° E., 8 miles	5	127.47
Gull Lake Dam		2	52.41
Total		44	1,119.34

1,119.34 divided by 44 = 25.44.

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In confirmation of this figure it appears from the map showing the average annual precipitations for Minnesota (Weather Bureau, Annual Summary, 1912) that Gull Lake Reservoir, as near as can be plotted to that scale, is two-thirds the distance from contour, 24 inches to contour, 26 inches or on contour 25.33. Then, assuming the normal of 25.44, the average for the past two years at Gull Lake Dam (26.21) is 0.77 inch above the normal.

17. The entire run-off for the two years (accumulation in the reservoir + discharge) was 4,342,793,400 cubic feet. The area of the entire basin is 287 square miles, and of this, 30 square miles is reservoir surface, leaving 257 square miles of land. The basins of Long and Round Lakes are included because it has been shown that these lakes change little in level—except at Round gets water from Gull—and their effective run-off, whatever it may be, must in their natural condition get to Gull Lake proper and be available to the reservoir. A total of 52.41 inches for the two years over an area of 287 square miles will give 15,042 mile-inches or about 34,945,000,000 cubic feet. Then the entire run-off divided by the entire rainfall gives the percentage of effective run-off or 12.4 per cent. Applying this to the normal rainfall (50.88 inches for two years) there results the run-off that can be expected from a normal two-year period or about 4,206,000,000 cubic feet.

18. From each reservoir it is considered that there must be a minimum discharge kept up at all times. For Gull Lake this is 15 second-feet, amounting to about 946,000,000 cubic feet for two years. By subtracting this from the last figures in the preceding paragraph we get 3,260,000,000 cubic feet which is the accumulation for the reservoir, less the minimum flow, or what it would accumulate, if nothing were used for navigation, in two normal years.

19. In the present condition, with no ditches dug, the storage capacity of Gull Lake proper and that of the upper 2 feet of Round Lake is available. This amounts to 3,091,000 cubic feet. With a normal year's run-off, less the minimum discharge (see preceding paragraph), at 1,630,000,000 cubic feet, it will be seen that the storage capacity of the reservoir is 89 per cent more than, or nearly double, the normal annual accumulation provided nothing more than the minimum discharge were allowed to escape. This is believed to be all that is necessary in the way of storage.

20. There has been already expended about $75,000 on this reservoir or about 2.4 cents per 1,000 cubic feet of its possible storage capacity, which is 89 per cent above normal annual supply of water. To expend the proposed estimate—and it has already been shown in paragraph 10 that this estimate is entirely inadequate—would mean buying increased storage capacity at 0.9 cents per 1,000 cubic feet. It has already been shown that there will be no increase in accumulation resulting from the expenditure, and that the added storage capacity will be needed only in very exceptional cases.

21. The run-off of this basin is not great enough to have material effect on floods in the Mississippi River. The entire Mississippi basin above St. Paul is given by the United States Geological Survey as 35,700 square miles. The watersheds above Pokegama, Sandy Lake, and Pine River Dams total 4,248 square miles. There is therefore a basin area, aside from Gull Lake, above St. Paul, of 31,452 square

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miles not controlled by dams, and of this 287 (less than 0.9 per cent) is in the Gull Lake Reservoir basin. Neglecting the fact that the minimum flow is supposed to be kept up out of Pokegama, Sandy, and Pine River, and assuming them as entirely shut, it may be expected that nine-tenths of 1 per cent of a flood discharge at St. Paul represents the flow from this reservoir basin, even if the reservoir happened to be full and unable to hold any of the flood. It may then be assumed that Gull Lake Reservoir, as a means of preventing flood, at or below St. Paul, is almost a negligible factor. The maximum recorded discharge at St. Paul is 117,000 second-feet and nine tenths of 1 per cent of that would be 1,053 second-feet.

22. It therefore appears that there is nothing to warrant the expenditure of the estimate for these ditches and bridges, and I am in the position where I must ask for additional funds to accomplish a work which appears entirely unnecessary.

23. The excuse for the expenditure of any funds narrows itself down to the simple proposition of keeping faith with the local residents who have granted flowage rights, generally without any money payment, and entirely, so as far as the United States is concerned. These people have great ideas of lakes kept full to the flowage plane and connected by permanent canals of navigable depth which will allow any resident on the lakes to reach the two railroad stations—one at the east end of Long Lake and one at the north end of Gull Lake. At the same time they appear more partial to the maintenance of lake level than to navigation possibilities; appreciate the fact that, without the maintenance of lake level, there could be no navigation even if the ditches were dug; and that the drawing down of Gull Lake, if the ditches were dug, would draw down the smaller lakes to an undesirable level. How much was promised them, no one is able to state, since the negotiations were carried on verbally by an assistant engineer who left nothing in the records and has since died. Two men of position in the community state that they were promised that Gull Lake would be kept full and never drawn upon until all other reservoirs were exhausted. This does not seem reasonable as its primary purpose is for quick delivery to St. Paul whenever needed, and this generally means work early in the season rather than late. To figure Gull Lake as a reserve supply for the general help of navigation is absurd. As far as navigation from Brainerd to Grand Rapids is concerned, it is entirely below this reach. As far as navigation below Minneapolis is concerned, it is only necessary to note that during the navigation season of 1912—a year when the reservoirs were low and only the water absolutely necessary was discharged—the discharge from the whole system amounted to 29,300,000,000 cubic feet and Gull Lake's normal supply is only 1,630,000,000 cubic feet. Again no reservoir is allowed to go through the winter in a full condition. They must be drawn down so as to have storage enough to hold the probable spring run-off. Then, if the spring brings little rain, the reservoir must go through the summer in a low condition. Therefore none of the alleged promises to the residents can be kept without vitiating the use of the reservoir.

24. In the policy of handling Gull Lake Reservoir, however, the lake will generally be full or near full in the summer season, provided the spring rains are enough to fill up the draw-down made

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during the winter for the purpose of holding those rains. The reservoir is used primarily for furnishing water at Minneapolis until the discharge from Pokegama can arrive at the mouth of Crow Wing River. It is then closed to minimum discharge and allowed to fill if there is run-off to do it. The carrying out of this policy is the reason why there will, as stated in paragraph 7, be a decided current in the ditches for only a small part of the year.

25. The United States has flowage rights on all these lakes—Gull, Round, and Long—and these have been, in some cases, voluntarily surrendered as a result, as claimed, of the promises made; in some cases reserved on Government lands; and in some cases purchased from landowners by interested parties and donated by them to the United States. In case the ditches be not made all rights on Long Lake can be surrendered again, since that lake will not be affected by the reservoir. On Round Lake the flowage rights must be retained, for it will, at the higher stages, be at the same level as Gull Lake and possibly for very short periods a little higher level. But it can never be drawn down below 1195, and a level below that would be very distasteful to the shore residents. The conditions of flowage in Gull Lake will remain unchanged whether the ditches be dug or not.

26. It is believed that those who donated flowage rights on Long Lake can have no claim on any promises made, whatever they were, if the rights be surrendered. It is hoped that those on Round Lake will be better satisfied with conditions without the ditches, when it is explained to them that the result of their construction may be to leave them through a season with their lake down to a level of possibly 1193, whereas under the present conditions it can not be drawn down below 1195 and will generally be above that level. How the donators on Gull Lake proper will view the situation I am unable at present to estimate. Over all this hangs the cloud of human nature—a desire to be permitted to get somewhere, where present conditions preclude. There is little doubt that many a resident on Gull Lake will find himself aggrieved because his long-promised opportunity to run his launch from Gull Lake to Long Lake is never to materialize, although he might never take advantage of it.

27. It is recommended that a public hearing be held in Brainerd, inviting all interested parties to attend, and that the whole situation be gone over and explained and a conclusion arrived at as to the status of local feeling. This may result in a satisfaction with present conditions and will at least give some data on which to proceed to further recommendations.

28. Another alternative is to stand squarely on the statement that the work can not be done for the money available and that Congress can not be expected to appropriate additional funds to carry out a useless purpose, and one which the engineer department can not recommend.

29. A third alternative is for Congress, if it feels that an injustice will be done the donators in abandoning this part of the project, to authorize the expenditure of remaining funds in the compensation of the landowners where they have not already been compensated This will do away with any annual maintenance expense beyond the lost interest on the money so paid out.

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30. This office stands ready to carry out any one of these suggestions, although that outlined in paragraph 28 will probably make the responsible officer very unpopular in that part of the country.

31. Blue print[1] is inclosed showing the result of the survey of March and April, 1913.

CHAS. L. POTTER,
Lieut. Col., Corps of Engineers.

SUPPLEMENTAL REPORT OF THE DISTRICT OFFICER AND THE DIVISION ENGINEER.

UNITED STATES ENGINEER OFFICE,
St. Paul, Minn., November 14, 1913.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Gull Lake Reservoir.

1. In accordance with second indorsement on my report of September 11, 1913, on the above subject the following report is submitted:

2. The public hearing authorized in said indorsement was held at Brainerd, Minn., October 30, 1913, after due notice to interested parties and the local public in general. A copy of the minutes, with accompanying letters and petitions, is inclosed.[1]

3. The result of the hearing was to bring out the fact that the local sentiment is in unanimous favor (excepting one dissenting letter from Leon E. Lum, an attorney of Duluth, having a summer residence at the upper end of Gull Lake proper) of the canals.

4. The arguments put forth in favor of the canal were (*a*) communication between the lakes, (*b*) keeping faith with the people some of whom had donated flowage rights with the expectation or promise that the canals would be provided, and (*c*) advantages to the reservoir.

5. These will be discussed under the above headings:

(*a*) There is little doubt that navigation between the three lakes would be most satisfactory to local residents. It would give all the residents of any lake access to a railroad at two points, but the same railroad. It would be a great addition to the pleasure of local residents and to the summer colony which is rapidly increasing on all these lakes. In fact, it would be most attractive to all interested parties. But its execution can not be considered as a reservoir project. It is one of navigation within the reservoir which is not a part of the reservoir project, and therefore the expenditure of funds for such a purpose should not be undertaken under the existing appropriation.

(*b*) There has long been talk of the wonderful promises held out to the people of a system of interlake navigation which would result from the construction of the reservoir. The public hearing brought out the fact that the promise was the appropriation act which included the words "and ditches between Gull Lake and Round

[1] Not printed.

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Lake and between Round Lake and Long Lake." It can be seen that this provision might, in the minds of the local residents, be construed as a promise. It is not, however, so understood by this office, and it was explained at the hearing that an appropriation by Congress did not promise that it would be expended in case the work be found to be not justified. It is undoubtedly true that much local sentiment was created in favor of the reservoir, and even flowage rights donated, through this apparent promise of connecting canals. It is not seen, however, that the bare appropriation act can guarantee the construction under the conditions existing.

(*c*) The only argument in favor of the ditches from a reservoir standpoint was that a larger area to fill would warrant this office in allowing the reservoir to go into the spring rains at a higher level than would be safe to maintain in Gull Lake alone, and at the same time provide sufficient storage for a possible spring flood. This argument has little bearing on the efficiency of the reservoir. The advantage would be to leave the whole system, through a summer of little rainfall, at a higher level than Gull Lake alone might be. In a season when the run-off was about the minimum flow from the reservoir the reservoir would go through the summer at the level to which it would be drawn down for flood prevention. With Gull Lake alone this level would be lower than with all three connected. But when this argument is analyzed it will be found to be largely one for better lake level for summer residents and more certain navigation through the canals. It can not justify the expenditure for reservoir purposes.

6. As set forth in my previous report, there is no justification for connecting these lakes, even at an expenditure of the present estimate, either from the standpoint of increased supply to, or increased storage capacity in, the reservoir.

7. It was also set forth that the available funds were entirely inadequate on account of—

(*a*) Estimate of yardage too low.
(*b*) Price per cubic yard too low.
(*c*) No protection provided for ditches or ditch ends.
(*d*) No estimate made for maintenance.
(*e*) Additional ditch needed in Long Lake.

8. These will be taken up in order:

(*a*) The estimate for yardage has been increased to cover the excavation of the ditches into the lakes to a level of 1191. To be thoroughly effective the ditches should be dug deeper, but the method of operation of the reservoir would not often draw the water down below 1192 or 1193, and it would scarcely be necessary to go below 1191 for the ditch bottoms.

(*b*) With the increased yardage due to extending the ditches into the lakes, and by constructing the jetties first so as to protect the dredge while excavating between them, contractors on ditch work think the work can be done at the former estimate—35 cents per cubic yard.

(*c*) It was stated in the former report that protection to the ditches would be required throughout. The method of operating the reservoir will produce only slight currents ordinarily, and it is not thought absolutely necessary to revet the banks in high ground if

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the extensions into the lakes are thoroughly protected. Later experience, however, may show that the banks will need protection in order to avoid heavy maintenance expense.

(*d*) It is not thought probable that an average maintenance estimate on all classes of work involved can be less than 5 per cent per annum.

(*e*) An estimate is added for the ditch connecting the two parts of Long Lake and a bridge over the ditch. It might be argued that opening up the natural outlet of Long Lake would be less expensive than the two ditches involved in the other plan. The natural outlet route is estimated to increase the cost of all the connections by 28 per cent and make it about the total cost of the reservoir to date.

9. The estimate, therefore, becomes:

(*a*) Connecting Round Lake to Gull Lake:	
Excavation, 6,223 cubic yards, at 35 cents	$2,178.05
Brush and stone jetties, 7,400 cubic yards, at $1.50	11,100.00
Highway bridge	2,468.00
Total	15,746.05
Contingencies (about 10 per cent)	1,553.95
	17,300.00
(*b*) Connecting west end of Long Lake to Round Lake:	
Excavation, 16,451 cubic yards, at 35 cents	5,757.85
Brush and stone jetties, 11,700 cubic yards, at $1.50	17,550.00
Bridge	1,992.00
Right of way	200.00
Total	25,499.85
Contingencies (about 10 per cent)	2,500.15
	28,000.00

This makes the cost of properly doing the original work supposed necessary $45,300. The survey developed the fact that an additional ditch must be dug between the two parts of Long Lake.

(*c*) Connecting two parts of Long Lake:	
Excavation, 5,936 cubic yards, at 35 cents	$2,077.60
Brush and stone jetties, 3,308 cubic yards, at $1.50	4,962.00
Bridge	1,000.00
Total	8,039.60
Contingencies (about 10 per cent)	760.40
	8,800.00

This makes a total cost of properly constructing the ditches of $54,100. If maintenance be taken at 5 per cent it will amount to $2,705 per year. It is with hesitation that the maintenance per cent is put as low on ditches through sandy soil and on brush and stone jetties exposed to alternate wet and dry by varying lake levels.

10. It therefore appears that the cost of the cheapest effective ditches will be $54,100, with $2,700 annual maintenance. It is stated as the cheapest because no bank protection to the canals in high ground is provided, and experience may show its necessity, and the canals are estimated for a bottom level of only 1,191. Greater desired efficiency, or popular demand for greater depth, might call for deeper excavation.

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11. As already pointed out in the original report, there is absolutely nothing to justify such an expenditure to complete Gull Lake Reservoir. It has already cost about $75,000, and to complete it would add 70 per cent to the cost, would not increase its available supply of water, and would produce an increased storage capacity, which is not needed, since it is now large enough for all available run-off.

12. I am therefore forced to revise the estimate for properly connecting these lakes, in accordance with the river and harbor acts of March 2, 1907, and July 25, 1912, by increasing it from $12,998 to $54,100—an addition of $41,102, making the total cost $126.102, instead of the $85,000 already appropriated. I am constrained at the same time to report that there is nothing to justify the expenditure as a part of the cost of Gull Lake Reservoir.

13. I therefore recommend that that portion of the Gull Lake project be abandoned and that the proper steps be taken to notify Congress that that portion of the project is considered unworthy of execution.

CHAS. L. POTTER,
Lieut. Col., Corps of Engineers.

[First indorsement.]

OFFICE DIVISION ENGINEER, WESTERN DIVISION,
St. Louis, Mo., December 10, 1913.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. Forwarded.

2. I concur with the district officer, that the proposed ditches will add very little, if anything, to the value of the Gull Lake Reservoir, that the estimates for the work should be increased, and that the construction of the proposed ditches under the increased estimates is not justifiable as a part of the cost of the Gull Lake Reservoir. The recommendation of the district officer is also concurred in that this portion of the Gull Lake project be abandoned.

C. McD. TOWNSEND,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors see p. 2.]

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 414.

SOUTH FORK OF KENTUCKY RIVER, KY.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF SOUTH FORK OF KENTUCKY RIVER, KY., WITH A VIEW TO CONSTRUCTING AN ADDITIONAL LOCK AND DAM.

DECEMBER 16, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 15, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated July 7, 1915, together with copy of a report from Lieut. Col. H. Jervey, Corps of Engineers, dated May 1, 1915, on preliminary examination of South Fork of Kentucky River, Ky., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, July 7, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of South Fork of Kentucky River, Ky.

1. There is submitted herewith for transmission to Congress report dated May 1, 1915, by Lieut. Col. H. Jervey, Corps of Engineers, on

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preliminary examination of South Fork of Kentucky River, Ky., with a view to constructing an additional lock and dam, called for by the river and harbor act approved March 4, 1915.

2. The South Fork of the Kentucky River joins the main stream at Beattyville, Ky. A few miles below the town is Lock No. 14, which is the upper lock of the Kentucky River system. This lock is now nearing completion and will extend slackwater for a few miles up the South Fork. The district officer, who is also division engineer reports that from an engineering standpoint the construction of a lock and dam on the South Fork is feasible, but from a commercial standpoint there is little to encourage further expenditures for extension of slackwater, and he is of opinion that the construction of the proposed additional lock and dam should not be undertaken by the Federal Government.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated June 15, 1915, concurring in the views of the district officer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of the South Fork of Kentucky River, Ky., with a view to constructing an additional lock and dam, is not deemed advisable at the present time.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
June 15, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. The following is in review of the district officer's report on preliminary examination of South Fork of Kentucky River, Ky., with a view to constructing an additional lock and dam, called for by the act of March 4, 1915.

2. The South Fork of the Kentucky River joins the main stream at Beattyville, a short distance above Lock No. 14, the upper one of the Kentucky River system, now nearing completion, which will pool this fork for a few miles.

3. Navigation on the South Fork is practically limited to the running of logs and ties and the transportation of the supplies of the locality by push boats. The district officer, who is also division engineer, states that the section to be benefited by a single lock and dam is rather sparsely populated, small in area and with resources undeveloped even in a small way. He reports the South Fork as unworthy of improvement.

4. Interested parties have been informed of the tenor of the district officer's report and given an opportunity of presenting their views. Two communications have been received and given consideration.

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5. There is very little commerce on this stream and little prospect of any developing as a result of the proposed improvement, certainly not enough to justify the cost. The board therefore concurs with the district officer in the opinion that it is not advisable at this time for the United States to undertake the improvement of the South Fork of the Kentucky River, with a view to constructing an additional lock and dam.

6. In compliance with law, the Board reports that there are no questions of terminal facilities, waterpower, or other related subjects which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

PRELIMINARY EXAMINATION OF SOUTH FORK OF KENTUCKY RIVER, KY.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
SECOND DISTRICT,
Cincinnati, Ohio, May 1, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Preliminary examination, South Fork of Kentucky River, Ky.

1. In compliance with department letter of March 15, 1915, the following report is submitted on the preliminary examination of the South Fork of Kentucky River, Ky., with a view to constructing an additional lock and dam provided for in the river and harbor act of March 4, 1915.

2. The South Fork of the Kentucky River, as its name indicates, drains the most southerly portion of the headwaters or mountainous district of the Kentucky River watershed; rising in the counties of Knox, Leslie, and Clay, and flowing in a general northerly direction. It empties into the main channel at Beattyville, the county seat of Lee County, which is situated a few miles below the approximate upper limit of slackwater as contemplated by the current Kentucky River project now nearing completion. The South Fork proper extends from Beattyville to the junction of Goose and Redbird Creeks in Clay County, a distance of about 35 miles. The area drained by this stream and its tributaries is approximately 760 square miles and embraces in whole or in part the counties of Lee, Owsley, Clay, Knox, and Leslie. The small scale map herewith [1] shows the stream and its position relative to the other main forks of the Kentucky River and the railway lines nearest to the territory drained. Within the boundaries of this watershed are to be found the best natural agricultural lands of the entire mountainous section that is drained by the three forks of the Kentucky River.

3. In general the navigation of this stream is limited to the running of logs and crossties downstream, either loose or in rafts, and

[1] Not printed.

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the transportation of the supplies of the locality from down-river points by push boats, there being at present no railroad facilities adjacent to the river, the nearest station being at Beattyville, at the mouth of the river.

4. Although considerable coal was formerly mined on this stream and sent out to market at points below on freshets in small boats, this commerce has wholly disappeared since the construction of the railroad along the main river and the North Fork into more accessible coal areas. The data available as to the mineral wealth of this locality are general in character and but little is known either as to the area or value of the coal veins which might, if developed, seek slackwater transportation. Dam No. 14 on the main river is now nearing completion and will throw a good depth for navigation into and a few miles up the South Fork.

5. A recent survey of the lower part of the river indicates that there are no especial engineering difficulties in the way of building a lock and dam; bedrock is not at great depth and the slope of the stream is not excessive. The low-water width in the locality in which the works would be located is sufficient for handling barges and there are no natural obstructions. The artificial obstructions consist of two highway bridges, one near the mouth and one 10 miles above at Booneville.

6. From an engineering standpoint the improvement is wholly feasible, but from a commercial standpoint there is little in sight or in prospect to encourage further expenditure for locks and dams. No developments have occurred or are in prospect which will materially increase the commerce on the more than 250 miles of slackwater now available; in fact, commerce has decreased with the increase of slackwater mileage. Although the general locality is developing and improving, its commerce is carried by the railroads and not on the rivers. The section to be benefited by a single lock and dam is rather sparsely populated, small in area, and its resources are undeveloped even in a small way. The only town adjacent is Booneville, with a population of only about 600.

7. For the reasons above stated, I am of the opinion that the construction of an additional lock and dam on the South Fork of the Kentucky River should not be undertaken by the Federal Government.

8. There are no questions of terminal facilities, water power, or other related subjects which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

H. JERVEY,
Lieut. Col., Corps of Engineers.

[For Report of the Board of Engineers for Rivers and Harbors see p. 2.]

LETTER OF MR. THOMAS PRYSE.

BEATTYVILLE, KY., *May 10, 1915.*

Subject: Lock and dam for the South Fork of Kentucky River.

GENTLEMEN: In response to a communication from the district engineer officer, second district, Cincinnati, of date May 1, 1915, I desire to write that the country (Owsley and Lee Counties) traversed by the South Fork of the Kentucky River is

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one of vast and unimproved riches, consisting of farming lands and untold mineral wealth, iron, bituminous and cannel coal and this territory has no outlet whatsoever, owing to the river being unnavigable from this point and an utter lack of roads, due to the mountainous country and the soft clay soil. If a lock and dam should be built in this the South Fork of the Kentucky River, it would be of incalculable benefit to the people living in this section and Owsley and Clay Counties, and for the above set out reasons I pray for the improvement, viz, a lock and dam of this fork of this country.

Very sincerely,

THOMAS PRYSE.

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

LETTER OF MR. ELIHU LAWS.

BEATTYVILLE, KY., *May 13, 1915.*

SIR: I am very much in favor of the lock and dam proposed to be put on the South Fork of the Kentucky River, for the reason that I think it would be of a very great deal of benefit to the people who reside on this fork of this river. There are thousands of acres of coal that could be taken out if this lock was put in.

Below is a list of names of prominent men who are in favor of this improvement: R. B. Flannery and Millard Thomas, Beattyville, Ky.; John Miller, Sam Rasner, Patrick Napier, Nathan Barnett, and Green Brandenburg, Lower Buffalo, Ky.

Very respectfully,

ELIHU LAWS.

The DISTRICT ENGINEER OFFICER.

[First indorsement.]

UNITED STATES ENGINEER OFFICE, SECOND DISTRICT,
Cincinnati, Ohio, May 15, 1915.

To the BOARD OF ENGINEERS FOR RIVERS AND HARBORS.
Forwarded.

H. JERVEY.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 415.

PORT CLINTON HARBOR, OHIO.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF PORT CLINTON HARBOR, OHIO.

DECEMBER 16, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 15, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit, herewith, a letter from the Chief of Engineers, United States Army, dated August 17, 1915, together with copy of a report from Maj. P. S. Bond, Corps of Engineers, dated June 12, 1915, on preliminary examination of Port Clinton Harbor, Ohio, made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, August 17, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Port Clinton Harbor, Ohio.

1. There is submitted herewith for transmission to Congress report dated June 12, 1915, by Maj. P. S. Bond, Corps of Engineers, on preliminary examination of Port Clinton Harbor, Ohio, called for by the river and harbor act approved March 4, 1915.

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2. The harbor of Port Clinton is about 72 miles westerly from Cleveland and comprises the lower half mile of the Portage River. It has been under improvement by the United States since 1872. The existing project provides for the construction of jetties extending across the bar at the mouth of the river to a depth of 12 feet in the lake, and for dredging the channel to a depth of 12 feet below mean lake level, at an estimated cost of $90,000. The project has been completed. The water-borne commerce of Port Clinton is small and consists chiefly in fish and the receipt of lumber for local consumption, present facilities being adequate for the former. The improvement now apparently desired is an increase of channel depth to 14 feet, in order to attract larger freight and passenger vessels. The district officer states that an increase of depth to 14 feet would not serve to accommodate the large vessels now in general use on the Lakes, and it is doubtful if it would divert much of the rail traffic. He is of opinion that no extension of the project is advisable at this time, and in this view the division engineer concurs.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated July 13, 1915, concurring in the views of the district officer and division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Port Clinton Harbor, Ohio, is not deemed advisable to a greater extent than is authorized by the existing project.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
July 13, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's report of preliminary examination of Port Clinton Harbor, Ohio, called for by the act of March 4, 1915.

2. This harbor is at the mouth of Portage River, 22 miles by water west of Sandusky, Ohio. The existing project provides for the construction of jetties extending across the bar at the mouth of the river to a depth of 12 feet in the lake and for dredging the channel to a depth of 12 feet below mean lake level, at an estimated cost of $90,000. There has been expended approximately $106,000, of which $34,000 was for maintenance. The project has been completed and only requires maintenance, the available depth now being about 11 feet.

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3. The water-borne commerce consists principally of lumber, fish, fruit, and coal, and amounts to about 6,500 tons. The improvement desired appears to be an increase in depth to 14 feet to accommodate larger vessels and to influence passenger traffic between Port Clinton and Put-in-Bay. The district officer states that an increase of project depth to 14 feet would not serve to accommodate the large vessels now in general use on the Lakes; that it is doubtful if it would divert much of the rail traffic; and that there are no growing industries greatly in need of water facilities. He reports that no extension of the project is advisable at this time, but that maintenance should be continued. The division engineer concurs.

4. Interested parties were informed of the unfavorable report of the district officer, and given an opportunity of presenting their views, but no communications on the subject have been received.

5. It will be seen from the statistics that the commerce of this harbor has never been large, and that even the small tonnage has been decreasing. There are no large manufacturing or commercial industries requiring water transportation, and there is little prospect of the commerce increasing materially, even if the harbor facilities are improved. The board therefore concurs with the district officer and the division engineer, and reports that in its opinion it is not advisable for the United States to undertake any more extensive improvement at Port Clinton Harbor, Ohio, than is authorized under the existing project.

6. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other related subjects which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

PRELIMINARY EXAMINATION OF PORT CLINTON HARBOR, OHIO.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Cleveland, Ohio, June 12, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Report on preliminary examination of Port Clinton Harbor, Ohio.

1. The river and harbor act approved March 4, 1915, contains the following provision:

> The Secretary of War is hereby authorized and directed to cause preliminary examinations to be made of the following-named localities: * * * Port Clinton Harbor, Ohio.

This duty was assigned to this office by department letter of March 15, 1915. A personal examination of the harbor and vicinity was made by the district officer May 28, 1915.

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2. The harbor of Port Clinton, Ohio, comprises the lower portion of the Portage River, which is navigable for 11 feet draft for a distance of 1¾ miles above the entrance. (Lake Survey chart, No. 364.) It is about 72 miles westerly from Cleveland, Ohio, by both land and water, and 13 miles by land and 22 miles by water westerly from the city of Sandusky, Ohio. The Portage River in its natural condition was rarely more than 5 feet deep across the bar at its mouth.

3. The first examination with reference to improvement was directed by act of March 2, 1867. A report and project were submitted in 1870 (Annual Report, Chief of Engineers, 1871, p. 210) for the construction of piers to protect the channel, at an estimated cost of $120,000. The following extract from the report of the engineer officer then in charge of the improvement of this harbor will explain the reason for deflecting the Portage River outlet from its original position:

> For a mile from the extremity of the peninsula, lying on the northern side of the river's mouth, the channel runs nearly parallel with the shore line in an easterly direction, its only protection lakeward being a bar of shifting sand, through which it finally enters the lake. Through this channel, which is quite crooked, only about 6 feet water can be carried at the stage of water given by the survey.
>
> If 8 feet depth could be given here the traders would be satisfied, for not more than 6 feet water can be carried down the Portage from the lumber mills above, which furnish the entire trade of this harbor.
>
> A channel 8 feet deep and sufficient width to accommodate the small vessels running here could be made at no very great expense; but it would be useless to do this, without at the same time constructing a breakwater for the whole length of the bar above mentioned to preserve the channel so deepened from being filled in by the action of the lake waves upon its exposed flank. Such a breakwater properly built would cost not less than $250,000.
>
> The only other alternative which presents itself, then, in order to make a good harbor here is to break through this bar at some convenient point and by the construction of an east and a west pier extending from the shore lakeward to the necessary depth, confine the waters of the river to the new opening, which would generally be kept open for the small vessels which alone make use of this harbor.
>
> This suggestion has been made before by Gen. Cram, and I agree with him in the location of the proposed cut, but not in the direction of the piers nor their mode of construction. By an examination of the sketch herewith it will be seen that opposite the outer extremity of the 6-foot river curve there seems to have been an effort made by the river water to break through the bar. Here I would locate the new mouth, limited on the east by a pier running from 8-foot water nearly perpendicular to the shore and on the west by a pier starting at the same depth and, with two or three changes of direction, reaching the end of the peninsula at the mouth of the river.
>
> This would require about 4,500 feet of piering, which, from its position, could near the shore line be built much lighter than a breakwater parallel with the shore, though at the outer ends the ordinary thickness of pier work for these waters should be maintained.

No appropriation was made for improvement, however, until June 10, 1872. The appropriation was small and no adequate improvement could be undertaken. A cut 20 feet wide and 8 feet deep was made from the river into the lake and a sand-catch fence 550 feet long was constructed north of the mouth of the river.

In 1875 the channel had been entirely filled. The construction of lines of sheet-pile bulkheads was begun on the west side of the channel in 1875 and on the east side in 1877, thus confining the river

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discharge and directing it toward the nearest point of required depth in the lake. The pile bulkheads were extended into the lake and the channel dredged to meet the needs of navigation for increased depth. The outer end of the channel was protected by stone-filled timber cribs 200 feet apart. In 1883 it was estimated that the total cost of the project would be $90,000.

In 1894 a channel was dredged about 11 feet deep and 100 feet wide between piers; the harbor in front of wharves was dredged about 11 feet deep and 200 feet wide; the bar and large rocky shoal lying in the path of vessels approaching the harbor were removed.

Previous to 1894 the total expenditures were $71,949. It was then recommended that the remainder of the estimated cost of the project ($21,000) be expended for necessary repairs.

In 1896 the pile bulkheads were much decayed and repair by addition of riprap on each side was begun. After settlement the stone was protected by a covering of larger stone which, above water, was laid as a pavement.

In 1902 a channel 150 feet wide and 12½ feet deep was dredged about 2,000 feet outward from the outer ends of the piers to a corresponding depth in the lake.

References to examination or survey reports and maps or plans (including project documents).

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entrance channels [1]					1868	150
Do.[1]					1871	II,210
Do.[1]					1875	1,295
Entrance channel and harbor [2]					1881	2290
Entrance channel [1]					1888	1987
Entrance channel and harbor [2]					1891	2836
Harbor, entrance channels and approach [2]					1894	2394
Report on proposed dredging to 12½ feet [1]					1900	4039
Harbor, entrance channel and approach [1]					1904	3159
Survey to Oak Harbor Bridge (report adverse to improvement).[1]	House...	189	Fifty-eighth.....	Second..	1904	3218
Entrance channel and harbor [2]					1909	2124
Entrance channel and harbor unfavorable report on project for depth of 14 feet.[2]	House...	815	Sixty-first.....	Second..	.....	.....

[1] No maps. [2] Contains maps.

4. The total expended on the existing (which is the original) project to date is $105,999.46, of which $34,044.60 was for maintenance of piers and dredged channels since 1894.

Piers 200 feet apart and reaching out about 1,200 feet to a natural depth of 12 feet in the lake have been constructed and maintained, and channels have been dredged to a depth of 12 feet below mean lake level 3,000 feet above the mouth of the river and into the lake about 2,000 feet beyond the outer end of the piers.

5. The maximum draft that can be carried over the shoalest part of the section under improvement is 11 feet.

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The usual variation in the level of the water surface during the season of navigation is from 1 foot above to 2 feet below mean lake level. Fluctuations due to wind are about 2 feet.

All depths are referred to mean lake level (Lake Erie), 1860–1875, elevation 572.77 feet above mean tide at New York.

Port Clinton Harbor is navigable for a draft of 11 feet to the new New York Central Railroad bridge, about 1¾ miles above the outer end of the piers. The channel from that point to Oak Harbor, 12 miles above the mouth of the river, is about 6 feet deep at the shoalest point.

The usual navigation season for this harbor is from March 15 to December 15.

6. The navigable portion of the river is crossed by three bridges: The highway bridge, 3,000 feet above the entrance, has a center pivot draw with clear width of openings 50 feet on the north side and 68 feet on the south side. The clear height above mean lake level is 8.8 feet.

The old New York Central Railroad bridge, 3,500 feet above the entrance, has a center pivot draw with clear width of openings of 60 feet. The clear height above mean lake level is 4 feet from under clearance line.

The new New York Central Railroad bridge, 1¾ miles above the entrance, has a rolling lift span with clear width of opening of 110 feet and a clear height of 10½ feet above mean lake level. Under the permit issued by the Secretary of War for the construction of this bridge, the old New York Central Railroad bridge is to be removed not later than December 31, 1916.

7. The present water-borne commerce of Port Clinton consists of receipt of lumber and fish, and shipment of lumber, fruit, and coal.

STATISTICS FOR THE CALENDAR YEAR 1914.

Season of navigation opened March 29, closed November 3.

Vessel classification.

Classes.	American	Foreign.	Total.	Net registered tonnage.
ENTERING.				
Registered:				
Steamers	1,087	.....	1,087	21,320
Barges	1	.....	1	262
Total	1,088	.....	1,088	21,582
DEPARTING.				
Registered:				
Steamers	1,087	.....	1,087	21,320
Barges	1	.....	1	262
Total	1,088	.....	1,088	21,582

Passengers, 4,283.

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Freight traffic.

Articles.	Amount.		Valuation.	Average haul or distance freight was carried.	Rate per ton-mile.
	In customary units.	In short tons.			
ENTERING.				*Miles.*	*Mills.*[1]
Lumber	910,432 feet b. m.	1,365	$30,030	320	1.6
Lath	125,000 pieces	32	640		
Cedar posts	5,995 pieces	120	1,200		
Sand	500 short tons	500	200	25	
Fish	2,696 short tons	2,696	159,870	25	
General merchandise		120	7,200	20	
Total		4,833	199,140		
DEPARTING.					
Bunker coal	1,500 short tons	1,500	4,875		
General merchandise		312	18,720	20	
Total		1,812	23,595		

[1] Approximate only. Impracticable to obtain figures for other items.

Water-borne commerce for the past 10 years.

Year.	Freight (tons).			Value.
	Receipts.	Shipments.	Total.	
1905	13,000	382	13,382	
1906	11,037	893	11,930	
1907	10,189	662	10,851	
1908	11,906	1,162	13,068	$257,400
1909	8,058	116	8,275	243,185
1910	6,629	3,548	10,177	324,340
1911	6,339	1,713	8,052	233,546
1912	4,892	3,035	7,927	173,389
1913	4,732	1,681	6,413	208,555
1914	4,833	1,812	6,645	222,735

The decline in receipts since 1910 is chiefly due to decrease in the lumber entering the port. This is said to be due to the increasing difficulty of entering the harbor due to shoals and to the narrowing of the channel between piers by placing riprap on the inside to support the decaying timber structures.

The following statement of receipts and shipments for the calendar year 1914 was rendered by the Port Clinton Lumber & Coal Co., which organization handles most of the traffic of this class at this port:

BY VESSEL.

	Tons.
Receipts:	
Lumber, lath, and shingles	3,000
Posts	1,000
Shipments:	
Lumber	800
Coal	500

BY RAIL.

Receipts:	
Coal	7,500
Lumber	8,500

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The company adds that about 2,000 tons of coal and 3,500 tons of lumber, in addition to the above, would possibly be shipped in by boat if the water was sufficiently deep.

The New York Central Railroad Co. reports that its present annual miscellaneous freight traffic at Port Clinton amounts to about 4,000 tons, divided about equally between receipts and shipments.

The National Retarder Co. reports total rail receipts and shipments of about 3,600 tons.

The raising of fruit, especially peaches, has become one of the leading industries of Port Clinton, the present annual shipment being about 300 carloads.

8. The wharf at the foot of Madison Street is owned by the village and is open to the public. This wharf does not directly connect rail and water lines at this time, but under an ordinance passed in 1912 by the village of Port Clinton, granting certain concessions to the Lake Shore & Michigan Southern Railway (now the New York Central Railroad) in return for certain improvements to be made by the railway company in Port Clinton, the above-mentioned road is to construct a siding from its right of way east to a point near the United Fish Co.'s wharf, as shown on the map [1] herewith. Quoting from the ordinance direct:

An ordinance requiring the Lake Shore & Michigan Southern Railway Co. to raise the grade of its tracks, to change the grade of certain streets, eliminating grade crossings, fixing terms and conditions upon which said railway company shall cross certain streets, and diverting and vacating parts of streets and alleys therein named.

Be it ordained by the council of the village of Port Clinton, Ohio:

SECTION 1. That the Lake Shore & Michigan Southern Railway Co. be, and it is hereby, required to raise the grade of the tracks of its main line. * * *

SEC. 5. That said railroad company be, and it is hereby, required to construct an industrial track by its existing tracks to the north and northwest of the intersection of its proposed new line between Madison and Jefferson Streets, and is hereby granted the right to perpetually maintain and operate such industrial track from a point near the intersection of Laurel Avenue with its proposed new line extending easterly to such industries, across all intersected highways and alleys, at the grade thereof. The easterly terminus of such industrial track shall be near the property of the United Fish Co., if the right of way east of the present line of the railway company shall be provided without expense to said company. Such industrial track shall be constructed and in operation before the removal of that portion of its main line, the grade of which is not herein required to be elevated.

Said company shall also have the right to lay and temporarily maintain and operate, at grade, across all intersected streets, alleys, public way, and grounds, such track or tracks for construction purposes as it will require in the reconstruction of its railroad through said village. * * *

No additional space is at present available for the construction of public wharves.

There are no terminal facilities held by individuals or corporations which are extended to all on equal terms. Terminal and transfer facilities not open to the public are owned by the Port Clinton Basket Co., the Port Clinton Lumber & Coal Co., and three fish companies.

The United States owns a frontage on the harbor of about 250 feet in addition to the piers. This is along the Government repair and storage yard. The depths of water available are sufficient for present and prospective uses of this property by the United States.

[1] Not printed.

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9. The present business of Port Clinton Harbor is principally fishing and receipt by water of lumber for local consumption. The main local manufacturing industries are an establishment that builds gasoline boats and launches, and plants for the manufacture of gypsum plaster and baskets.

It is stated by representatives of local interests that improved railroad connections from the south with passenger-vessel lines to Put-in-Bay are only held back by deficient depth in the channel and harbor. Complaints are made that vessels arriving with lumber are now frequently compelled to lighter part of their cargo to get into the harbor. The New York Central Railroad (formerly Lake Shore & Michigan Southern Railway) is the only rail line leading into Port Clinton. Present and prospective trackage of this railroad is shown on map herewith.

10. There are no questions of water power or other subjects so related to the project that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

11. A public hearing was held at Port Clinton on April 29, 1915, at the rooms of the Port Clinton Business Men's Association.

Congressman I. R. Sherwood was present at the meeting and spoke in favor of a 14-foot channel. He stated that he believed the shallow water impeded the business of the harbor and the growth of the population of the adjoining territory. In conclusion he referred to the marsh along the water front east of the harbor entrance as being a menace to the health of the people and a great damage to the property.

The marsh referred to has come into existence since the construction of the piers and it is claimed, and is undoubtedly a fact, that this formation is due to the deposit of mud in the quiet basin formed by the construction of the piers.

Mr. O. F. Dischinger, manager of the Port Clinton Lumber & Coal Co., stated that the falling off of commerce in the harbor was due to the shallow water, as their experience in past years showed that their company had to lighter many boats which became fast on ground in the channel when entering the harbor, and that it was difficult for the company to secure vessels of draft suitable for shipping lumber into Port Clinton. He added that during the past few years his company had received more lumber by rail on account of the condition of the channel.

Mr. A. G. Winnie and Mr. F. H. De Witt brought out the fact that the excursion traffic of former years had fallen off to almost nothing, due to two conditions: First, that the channel was too shallow to admit boats of draft engaged in the traffic; second, that the once clear sand beach had been replaced by swamp lands as a result of the present harbor construction.

Mr. F. J. Mitchell also spoke of the falling off of the excursion traffic, and further claimed that the shallow river had kept the city from having a southern outlet by an electric or steam road.

Mr. F. J. Griswold, vice president of the American Gypsum Co., spoke of the enormous amount of freight shipped out by his company every year, and that his company was compelled to use the railroads, as no freight boats entered the harbor. He claimed that a

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large portion of the products of his company was shipped to Cleveland, Detroit, Buffalo, and Chicago, and could therefore go by water if service could be had. In a letter to the district officer, Mr. Griswold stated that during the year 1914 his company shipped to Cleveland, Toledo, and Detroit approximately 19,000 tons of material, and received 15,000 tons of sand.

Mr. J. A. Wonnell, chairman of the business men's association, called attention to the fruit industry, and stated that thousands of bushels of fruit now went by rail. The total shipment in 1914 was 300 carloads. He added that the Port Clinton Fruit Co. would locate its packing houses along the river, so as to secure shipping advantages if sufficient depth were provided. Attention was called to the fact that fruit shipped by boat required no icing and was subjected to less rough handling than when shipped by rail.

12. At present there is no definite project for the improvement and maintenance of Port Clinton Harbor. From year to year recommendations have been made by the district officer pertaining to maintenance, the same having been approved and carried out.

A preliminary examination and survey of the harbor made in 1910 resulted in an adverse report to Congress on a project for obtaining and maintaining a channel 14 feet deep. (H. Doc. No. 815, 61st Cong., 2d sess.)

13. An examination of the harbor has been made and soundings taken to determine the available depth over the entire extent of the navigable portion of the river, the channel outside the piers, and portions of the lake in the vicinity. The existing depths below mean lake level are shown on the accompanying map.

The present depths in the harbor and entrance channel vary from 11 to 24 feet, and over the larger portion of the area are in excess of 12 feet. The piers are suitable for the protection of the entrance channel, but require some repairs, for which funds are now available.

14. The commerce of Port Clinton is small and unimportant. While it has shown a considerable fluctuation, there has been a general falling off during recent years. It is believed that this decline has not been due primarily to shoaling of the channels, since recent soundings indicate that good depths and widths are maintained naturally. The facts that the commerce has never been large and has fallen off of late are believed to be accounted for as follows:

The increasing size of lake vessels has caused commerce to seek other harbors where greater depths are provided. Port Clinton is not favorably located for a deep-draft harbor. It lies in the inner portion of a shallow bay, and is off the main routes of traffic. A very considerable expense would be involved in providing depth and maneuvering and wharfage facilities for large vessels. Even if this were done, a large channel entrance through the shallow bay would be required. This channel would need long costly piers for maintenance and protection to vessels entering or leaving. If not so protected, it would be difficult for vessels to keep to the channel if cross winds were blowing, and considerable maintenance dredging would probably be required, which could only be carried on during quiet weather. A deep-draft harbor (Sandusky) lies within a few miles of Port Clinton and is more readily accessible from the lake. There is no great need of a harbor of refuge at this locality. Protection

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can be obtained under the lee of the islands offshore or at the harbor of Sandusky.

15. Port Clinton is the county seat of Ottawa County, having a population of 22,360 (1910). The population of Port Clinton itself was 3,007 in 1910, and is said to be about 3,600 at present. The small population of the town and adjacent territory, and the figures as to water-borne and rail traffic shown herein, do not promise any adequate return in a large investment in improved water facilities.

16. It appears that the demand for increased depth is based largely on alleged prospects for passenger traffic. It is claimed that if greater depths were provided a line of passenger steamers could be operated to Put-in-Bay, developing this place as a summer resort, in competition with the successful resort at Cedar Point, near Sandusky. The success of this project would be contingent upon rail connections, either steam or electric, between Port Clinton and the territory to the south. It is thus rather conjectural, the benefits would be local, and a Government subsidy is apparently not advisable.

17. An increase of depth to 14 feet would not serve to accommodate the large vessels now so commonly employed on the Lakes, and it is doubtful if it would divert much of the rail traffic. There are no growing industries greatly in need of water facilities. The gypsum and plaster plants have no water frontage and, as they would consequently require rail connection and transshipment, it is doubtful if they would utilize water transportation to any great extent. For the fishing industry, which forms a considerable part of Port Clinton commerce, present facilities are sufficient.

18. For a deep-water harbor a complete rearrangement of the harbor works would be necessary. The present and prospective commerce and the geographical location of Port Clinton are such that any further extension of the improvement at this time would be inadvisable, and none is recommended, but in view of the good condition of the present works and the small expense involved the maintenance of the project appears to be advisable for the present. For a 12-foot depth the present works are believed to be well designed.

19. The present project is not definite as to the channels to be maintained. With reference to paragraph 5 of the act of Congress approved March 4, 1915, concerning project depths and planes of reference for same, attention is invited to the fact that all soundings, as shown on charts issued by the United States Lake Survey, are referred to "standard low water," elevation 570 feet above mean tide at New York. In order that depths may correspond with the charts issued by the United States Lake Survey, it is recommended that a project depth of 9.5 feet below standard low water be adopted for Port Clinton Harbor.

20. The following definite project is recommended for adoption (sec. 14, act Mar. 4, 1915). (The limits of the channels to be maintained are shown on accompanying map.)

Providing for the maintenance of the piers and of a channel 9.5 feet deep below standard low water from a natural depth of 9.5 feet in the lake to the county highway bridge. The widths of the 9.5-foot channel, as provided by the project, are as follows:

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Channel of approach to piers, 2,500 feet long and 200 feet wide; outer 1,000 feet of channel between piers, 100 feet wide; from that point inward, 900 feet long, increasing in width from 100 to 200 feet; dock channel and turning basin, 900 feet long and 200 feet wide.

21. The depth now recommended is practically what has previously been obtained and now exists over a considerable portion of the area included in the proposed project. It is estimated that the restoration of the depth now proposed as a definite project, 9.5 feet below standard low water, can be secured and that the piers can be thoroughly repaired if an appropriation of $1,500 is made available annually during the next three years, and that thereafter the maintenance of the project will require an appropriation of $1,500 every second year. Individual appropriations should not be less than $1,500, for the reason that a smaller amount is insufficient for the economical prosecution of work.

P. S. BOND,
Major, Corps of Engineers.

[First indorsement.]

OFFICE DIVISION ENGINEER, LAKES DIVISION,
Buffalo, N. Y., June 24, 1915.

To the CHIEF OF ENGINEERS:

1. Forwarded.

2. For reasons stated in paragraphs 14–18 of the district officer's report, his opinion is concurred in that Port Clinton Harbor is not worthy of improvement by the United States further than contemplated by the present project. This conclusion agrees with the recommendations of both the Chief of Engineers and the Board of Engineers for Rivers and Harbors in House Document No. 815, Sixty-first Congress, second session.

3. The present project, as stated on page 1249, Annual Report of the Chief of Engineers for 1914, viz—

> The existing project provides for the construction of jetties extending across the bar at the mouth of the river to a depth of 12 feet in the lake; for dredging the channel to a depth of 12 feet below mean lake level, at an estimated cost of $90,000; and for maintenance of the improvement—

is considered correct, and the change of definition of plane of reference recommended by the district officer in paragraph 19 of his report is not considered advisable, because it is desirable, for uniformity, to adhere to the definition of plane as used generally at Lake Erie harbors, viz, mean lake level, 1860–1875; low water 2 feet below mean lake level.

4. The definition for maintenance of the project channel limits, as stated in paragraph 20, third subparagraph, and shown on the map in the district officer's report, is recommended.

J. G. WARREN,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 416.

LEAF AND PASCAGOULA RIVERS, MISS.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORTS ON PRELIMINARY EXAMINATION AND SURVEY OF LEAF AND PASCAGOULA RIVERS, FROM THE MOUTH OF BOWIE CREEK TO THE JUNCTION OF PASCAGOULA AND DOG RIVERS.

DECEMBER 16, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 15, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated May 24, 1915, together with copies of reports from Maj. (now Lieut. Col.) Henry Jervey and Maj. (now Lieut. Col.) C. A. F. Flagler, Corps of Engineers, dated October 11, 1909, and September 30, 1911, with map, on preliminary examination and survey, respectively, of Leaf and Pascagoula Rivers, Miss., made in compliance with the provisions of the river and harbor act approved March 3, 1909; also copy of supplemental report by Lieut. Col. Charles Keller, Corps of Engineers, dated February 1, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, May 24, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination and survey of Leaf and Pascagoula Rivers, Miss.

1. There are submitted herewith, for transmission to Congress, reports dated October 11, 1909, by Maj. (now Lieut. Col.) Henry

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Jervey, Corps of Engineers, and September 30, 1911, with map, by Maj. (now Lieut. Col.) C. A. F. Flagler, Corps of Engineers, on preliminary examination and survey, respectively, of Leaf and Pascagoula Rivers, from the mouth of Bowie Creek to the junction of Pascagoula and Dog Rivers, called for by the river and harbor act approved March 3, 1909, together with supplemental report by Lieut. Col. Charles Keller, Corps of Engineers, dated February 1, 1915.

2. The Pascagoula River is formed by the junction of Leaf and Chickasahay Rivers, and flows in a southerly direction about 82 miles where it is joined by the Dog River. The existing project for its improvement provides for the maintenance of the channel above the mouth of Dog River by the removal of obstructions from the stream from time to time. The original project for improvement of Leaf River, adopted in 1890, was designed to provide a channel for high-water navigation from Bowie Creek to the mouth of the river, a distance of 79 miles. This project was completed in 1897, and subsequent expenditures have been in the direction of maintaining the improvement.

3. Estimates of cost for the further improvement of these streams are submitted by the district engineer officer in his report of September 30, 1911, covering (*a*) the completion of the present project in two years; (*b*) a channel 4 feet deep and 75 feet wide; (*c*) a channel 6 feet deep and 75 feet wide. He believes the locality worthy of improvement by the United States to a limited extent, and recommends adoption of the 4-foot project (plan *b*), at an estimated cost of $110,500, and $15,000 annually for maintenance, this estimate being based on executing the work with a Government plant equipped for snagging and dredging. In the supplemental report of February 1, 1915, his successor recommends that, for the present, work be confined to a more liberal prosecution of the present project below Merrill, at an estimated cost of $15,000 annually. The division engineer is of opinion that no greater or more expensive improvement should be undertaken by the Government than that necessary to facilitate the floating of logs.

4. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to the board's report of November 4, 1912. In connection with its consideration of the subject, the board inspected the locality and held a public hearing at Hattiesburg, Miss., on October 6, 1912. The board believes that if an all-year-round 4-foot navigation could be obtained for the sum estimated in the district officer's report of September 30, 1911, the resulting benefits would justify the expenditure. From its study of the physical data available, however, the board doubts the feasibility of obtaining the results expected by the district officer at the cost estimated by him. It believes that the expense involved would be out of reasonable proportion to resulting benefits, and therefore expresses the opinion that it is not advisable for the United States to undertake any additional improvement of the Leaf and Pascagoula Rivers at this time.

5. After due consideration of the above-mentioned reports, I concur in general with the views of the division engineer and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Leaf and Pascagoula Rivers, from the mouth of Bowie Creek to the junction of Pascagoula

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and Dog Rivers, is not deemed advisable at the present time, to a greater extent than is authorized under the existing project.

DAN C. KINGMAN,
Chief of Engineers, U. S. Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS ON SURVEY.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, November 4, 1912.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. This is a report of survey of Leaf and Pascagoula Rivers from the mouth of Bowie Creek to the junction of Pascagoula and Dog Rivers, called for by the act of March 3, 1909. The survey developed the following important facts:

Distance by river from Hattiesburg to mouth of Leaf River	miles..	78.86
From mouth of Leaf to mouth of Dog River	do....	82.10
Total distance from Hattiesburg to Dog River	do....	160.96
Fall in Leaf River	feet...	93.96
Fall per mile, about	do....	1.20
Fall in Pascagoula River	do....	31.07
Fall per mile, about	do....	.40
Navigable depth for 32 miles above Dog River	do....	8.00
Available low-water depth in Leaf River	do....	1.40
Number of shoals in these rivers with depths less than 4 feet		181

2. In its report on preliminary examination, the board requested estimates for the completion of the existing project by clearing the river of snags and obstructions, and for channels of suitable width and 4 feet and 6 feet in depth. Based upon the results of the survey, the district officer presents the following estimates:

(a) Completion of present project in two years:	
Work of improvement	$87,000
Annual maintenance	12,000
(b) For a 4-foot channel 75 feet wide:	
Estimate No. 1, based on dredging by contract—	
Work of improvement	248,560
Annual maintenance	25,000
Estimate No. 2, based on executing dredging with combined Government plant equipped for snagging and dredging—	
Work of improvement	110,500
Annual maintenance	15,000
(c) For a 6-foot channel 75 feet wide:	
Work of improvement	485,200
Annual maintenance	90,000

The district officer states that it would be practicable to secure navigable widths and depths on these rivers by canalization, but the cost of such work would be prohibitive.

3. From the data obtained by the survey, the theoretical discharge of the stream has been worked out for various sections, and based upon the figures obtained, the district officer states that it appears probable that a 4-foot depth could be maintained by regulation works, but that grave doubt exists as to whether a 6-foot depth could be maintained. At a public hearing held by the district officer, interested

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parties expressed their willingness to abandon log driving and sack rafting on these streams if they were properly improved, the county authorities expressed their readiness to make suitable alterations in existing bridges, and the commercial interests of Hattiesburg pledged themselves to maintain a traffic line on the improved river and to provide public landing places at Hattiesburg and Merrill. The district officer is of opinion that these streams are worthy of improvement by the United States to the extent of the 4-foot project, estimate No. 2, $110,500 for works of improvement, including the necessary plant, and an annual maintenance charge of $15,000. He states:

> If this project or some other involving channel excavation and regulation is not adopted for these streams, I recommend that work thereon be abandoned, as the present project produces little, if any, beneficial results.

4. The division engineer was unable to agree with the views of the district officer as to the practicability of accomplishing the desired results at the estimated cost, and states that it does not appear that the commerce involved would justify the large expense necessary to do the work. For this reason he does not recommend the improvement.

5. With a view to securing additional information and a more intimate knowledge of physical and commercial conditions, the board held a public hearing in the city of Hattiesburg on October 16, 1912, and made such inspection of the upper river as was possible for a distance of about 20 miles below Hattiesburg. Much interest was displayed in the question of this improvement, and it is reasonable to believe that considerable benefit would be felt by the people of Hattiesburg if continuous navigation of a practical character were obtained. Those advocating the improvement seem firm in the belief that if a 4-foot channel were provided, there would be considerable commerce carried upon the river, and that railroad rates would be materially reduced thereby. The board entertains some doubt as to the former but believes that to some extent the latter would be true. It believes further that if an all-year-round 4-foot navigation could be obtained for the sum estimated by the district officer, the resulting benefits would justify the expenditure.

6. A careful analysis of the physical data of this stream and a study of the results obtained by open-channel improvement on other shoal streams in this country leads the board to seriously doubt the feasibility of obtaining the physical results expected by the district officer at the cost estimated by him. The board is aware of no stream with the same low-water discharge, slope, and character of bed that has been effectively improved by open-channel methods so as to provide a continuous 4-foot navigation. While the results desired might be possible of attainment by the use of extensive and costly works, the board believes that the commerce, present and prospective, to be benefited is not sufficient to justify this large but uncertain cost.

7. While the board fully appreciates the disadvantage of not having effective water transportation, it believes in this case that the cost of providing it would be far greater than the figures given above, and that the expense involved would be out of reasonable proportion to resulting benefits. It is therefore forced to the conclusion that it is

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not advisable for the United States to undertake any additional improvement of the Leaf and Pascagoula Rivers at this time.

8. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other subjects which could be coordinated with the project proposed, in such manner as to render the improvement advisable in the interests of commerce and navigation.

For the board:

LANSING H. BEACH,
Lieut. Col., Corps of Engineers,
Senior Member Present.

PRELIMINARY EXAMINATION OF LEAF AND PASCAGOULA RIVERS, MISS.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., October 11, 1909.

SIR: 1. In compliance with instructions contained in department letter dated March 8, 1909, and in accordance with the provisions of river and harbor act approved March 3, 1909, I have the honor to submit the following report of a preliminary examination of Leaf and Pascagoula Rivers, from the mouth of Bowie Creek to the junction of Pascagoula and Dog Rivers. The present examination was made by Asst. Engineer J. M. Pratt, assisted by other employees of this office, between August 10 and 13, 1909, the entire distance, about 200 miles by river, being traversed by the party in the gasoline launch *Naomi*.

2. *Previous examinations and surveys.*—A preliminary examination of Leaf River from the mouth to Bowie Creek was made in 1889, under the direction of Maj. A. N. Damrell, Corps of Engineers, and report of same is printed in the Annual Report of the Chief of Engineers for 1889, page 1462.

The report of a preliminary examination of Pascagoula River is printed in the Annual Report of the Chief of Engineers for 1879, page 835.

3. *Geographical location.*—A description of the stream is given in the attached report of Asst. Engineer J. M. Pratt, to which attention is respectfully invited. Both streams are at present under improvement by the General Government. The existing project for Leaf River contemplates the maintenance of a channel for high-water navigation from Bowie Creek to the mouth of the river, a distance of 75 to 100 miles, by the removal of obstructions and overhanging trees. This project was completed in 1897, and since that year about $12,000 has been expended on maintenance.

The existing project for improvement of Pascagoula River above the mouth of Dog River provides for the maintenance of the channel by the removal of obstructions from the stream from time to time. The extent of the improvement was limited by the act of 1899 to the section above Dog River, and covers a distance of about 100 miles. The total amount expended on the existing project to June 30, 1909, was a little more than $29,000, all of which was applied to maintenance.

4. *Present condition of the streams.*—The Pascagoula River is nontidal except in its lower reaches. On June 30, 1909, the river was

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navigable at low water for boats of 5 feet draft as far up as Cedar Creek, about 55 miles, while above this point to the head of the river light-draft navigation was possible on a slight rise above low water. The lower 50 miles of the section of Pascagoula River under consideration are in good condition. About 94 sand and gravel bars were found in the river on the recent examination and 152 bars in Leaf River below Hattiesburg, Miss. On June 30, 1909, Leaf River was available for rafting on a fair rise above low water, being used to a very limited extent for any other form of navigation. The last examination showed that from the mouth of Bowie Creek, at Hattiesburg, Miss., to a point 30 miles below, Leaf River is filled with snags, logs, and gravel bars. The remainder of the river to its mouth is in fair condition. The width of Leaf River at low water varies from 100 to 350 feet, that of Pascagoula River from 150 to 500 feet.

The launch in which the examination was made is 33 feet long, 12 feet wide, with a draft of 3 feet. From such gauge readings as are available, Leaf River at Hattiesburg was 12 to 18 inches above the ordinary low-water stage, and Pascagoula River at Merrill, Miss., was 3 to 4 feet above the ordinary low water. Extreme low-water stages are shown in the accompanying report of the assistant engineer. While the launch made the trip in good time, many obstructions were encountered, indicating that steamboat navigation would be dangerous or impracticable on the upper reaches in the present condition of the streams.

Year after year snags and trees are brought into the river by high water and caving banks. Also, at high water large quantities of loose saw logs are floated out of the swamps and low lands where they have been previously cut and these drift down the river until caught at some boom or sawmill. Some of these logs sink and form obstructions in the river, many lodge against the banks and are left there when the water recedes. The trees, snags, or logs which stop in the bed of the stream cause the formation of bars; it is probable that if these obstructions were entirely cleared out each year there would be a reduction in the number of sand bars.

5. *Bridges.*—From Bowie Creek to the mouth of Leaf River there are 10 fixed bridges, with headroom above water (at the stage at which the examination was made) of from 23 to 31.5 feet. Spanning the Pascagoula River at Merrill, Miss., is a railroad bridge. This bridge has a draw span which is now being repaired, so that it will be in operation within a short time. With the exception of three bridges at Hattiesburg, the upper end of the proposed improvement, all of the above fixed bridges will have to be removed or provided with draw spans to accommodate the usual river steamboat traffic. As they now stand they limit the possible use of the river to barges or small steamers at moderate stages of the river, while at high stages nothing could pass them.

6. *Resources, industries, and commerce.*—The present commerce on Leaf River is limited to rafting logs and timber; its tonnage since 1905 has been about 200,000 tons annually, of a value estimated from $600,000 to $1,200,000. On Pascagoula River, 90 per cent of the tonnage is in logs, lumber, and piling seeking the sawmills or shipping at Moss Point; its amount is now 300,000 tons annually, with a value of $1,800,000. This represents an increase of about 30 per cent since 1905. The forests along these rivers still contain large quantities of

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fine timbers, both pine and hardwood. As the forests are cut, no doubt the land will be cleared and put into cultivation by an increase of population. At present, however, the country is sparsely settled and the development may be a matter of many years. The town of Hattiesburg, situated on Leaf River at the mouth of Bowie Creek, has a population of 15,000. The chief industries are sawmills, a cotton compress, and a fertilizer factory. A number of railroads enter Hattiesburg, which has direct connection with the seaports of New Orleans (117 miles), Mobile (97 miles), and Gulfport (70 miles).

7. *Improvement desired.*—The commercial interests of Hattiesburg desire an all-water route to the port of Pascagoula (Scranton), Miss., at which a dredged channel having a low-water depth of 17 feet has been constructed by the General Government. It is claimed that 100,000 bales of cotton and 100,000,000 feet board measure of lumber, now shipped by rail annually, could be shipped by river from Hattiesburg to Scranton were there sufficient depth, and an estimated saving to the community of $150,000 per year is argued. It is stated by the secretary of the Commercial Club that Hattiesburg is greatly discriminated against in the matter of freight rates, and comparison is made with the rates to Meridian, Miss., which is 135 miles from Mobile by rail. Data from the commercial clubs of Hattiesburg and Pascagoula herewith,[1] as Exhibits B, C, and D.

8. *Conclusions.*—Hattiesburg desires a waterway of 4 to 6 feet low-water depth and suitable width. While such a channel uniformly available during the greater part of the year would be of benefit to the community, the actual saving to be effected is problematical. It seems that the present discrimination in freight rates as compared with Meridian is due to other causes than the lack of water transportation and is rather a matter for adjustment with the several railroads. Hattiesburg's choice of three seaports for the export of her products should insure active competition and reasonable rates.

Under the present projects for improvement, a considerable commerce has developed on the streams in question. When the small and scattered allotments for the work of maintenance are considered, it is evident that these channels have not been maintained up to their maximum capacity. For several years at a time no work was done, the available funds being not sufficient to construct a suitable snag boat and the existing plant unable to do more than clear out the lighter obstructions. Recently a self-propelling snag boat has been built for use jointly on the Pascagoula, Leaf, and Tombigbee Rivers. It will be able to operate part of the time on the Pascagoula and lower Leaf; for the upper river, another snag boat of special design and ample lifting power must be provided. This has been recommended in the last annual report. It is my opinion, however, that two snag boats can be fully occupied with work on the Pascagoula, Leaf, and Chickasahay Rivers, Miss., which are now classed as one improvement in the appropriation acts. To satisfy this requirement, funds for the construction and continuous operation of two snag boats should be provided. Constant attention every season to the rivers under consideration is essential. If the removal of obstructions is carried on systematically and the lumbering interests will unite to prevent loose saw logs and deadheads entering the stream, I believe

[1] Not printed.

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that the existing projects will produce channels sufficient for the present needs of tributary population and for a larger commerce than now exists. The prospective commerce may in time require more capacious channels; they can be created more cheaply and more intelligently if the preliminary work is well done.

In view of the above arguments relative to the present and prospective commerce and the possibilities of the existing projects for improvement, I am of the opinion that the locality in question is not worthy of improvement by the General Government further than in the manner and to the extent now authorized by the existing projects for improvement. I therefore recommend that no survey be made of the locality.

9. *Special subjects.*—None of the special subjects of inquiry mentioned in section 13 of the river and harbor act of March 3, 1909, are pertinent to this proposed improvement.

Respectfully submitted.

H. JERVEY,
Major, Corps of Engineers.

The CHIEF OF ENGINEERS, UNITED STATES ARMY
(Through the Division Engineer).

[First indorsement.]

OFFICE DIVISION ENGINEER, GULF DIVISION,
New Orleans, La., October 14, 1909.

1. Respectfully forwarded to the Chief of Engineers, United States Army.

2. The district officer appears to think that the project for improvement of these streams, if carried out with sufficient funds, will afford the desired commercial relief to the localities interested. It would appear advisable to give the plans already adopted a fair trial before making further and more expensive projects. If the communities affected by the waterways are found to be benefited by their improvement, and properly utilize them, the character and extent of further improvements can then be better determined than is possible at this date.

3. The improvements already planned should be fully made and given a trial before more expensive plans are prepared. With this view of the case, it is believed that the locality in question is, at this time, not worthy of improvement by the General Government further than already authorized.

LANSING H. BEACH,
Lieut. Col., Corps of Engineers,
Division Engineer.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, D. C., November 8, 1909.

Respectfully returned to the Chief of Engineers, United States Army.

1. The existing project for the improvement of these streams contemplates the removal of obstructions and overhanging trees, covering a distance of about 100 miles in each stream. The Pasca-

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goula is navigable for light-draft boats at stages slightly above low water, while the Leaf is available only for rafting and at stages above low water, the stream being used to a very limited extent for any other form of navigation. Those interested desire a reasonably permanent navigable channel 4 to 6 feet in depth.

2. The district officer and the division engineer are of opinion that if work under the existing project is vigorously prosecuted, and the rivers kept free from snags and obstructions, the present demands of commerce will be fairly well met, and that this project should be fully carried out before a more extensive improvement is undertaken.

3. Interested persons were notified of the adverse report of the district officer and invited to submit statements and arguments to the board bearing upon the questions involved, and at the request of Hon. E. J. Bowers, M. C., a hearing was given in the offices of the board on November 1, 1909, which was attended by Mr. Bowers and two representatives of the town of Hattiesburg, located on Leaf River near the head of the desired improvement.

4. From the statements and arguments presented, the board has arrived at the conclusion that a survey and estimate of cost should be made to determine the question of the advisability of any further improvement than is contemplated by the existing project. It is therefore recommended that a survey be authorized and that estimates be prepared for—

(*a*) Prosecuting the work vigorously under the existing project, with a view to clearing the river of snags and obstructions;

(*b*) For a channel of suitable width and 4 feet in depth;

(*c*) For a channel of suitable width and 6 feet in depth.

For the Board:

WM. T. ROSSELL,
Colonel, Corps of Engineers,
Senior Member Present.

[Fourth indorsement.]

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, November 15, 1909.

1. Respectfully submitted to the Secretary of War.

2. This is a report on preliminary examination of Leaf and Pascagoula Rivers, Miss., authorized by the river and harbor act of March 3, 1909.

3. Inviting attention to the report of the Board of Engineers for Rivers and Harbors in the preceding indorsement, I recommend that a survey of the locality and preparation of estimates, as proposed, be authorized.

W. L. MARSHALL,
Chief of Engineers, United States Army.

[Fifth indorsement

WAR DEPARTMENT, *November 16, 1909.*

Approved as recommended by the Chief of Engineers.

ROBERT SHAW OLIVER,
Assistant Secretary of War.

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REPORT OF ASSISTANT ENGINEER J. M. PRATT.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Mobile, Ala., September 24, 1909.

SIR: I have the honor to submit the following report of a preliminary examination of Leaf and Pascagoula Rivers, from the mouth of Bowie Creek to the junction of Pascagoula and Dog Rivers.

This examination was made in compliance with your directions and in accordance with the act of Congress approved March 3, 1909.

Geographical location.—Leaf River rises in Scott County, Miss., in the south-central portion of the State and flows in a southeasterly direction, emptying into Pascagoula River at Merrill, Miss., in the southern part of Greene County. The limits of the proposed improvement, however, and of the present project extend only up to Bowie Creek which empties into Leaf River at Hattiesburg, Miss. From this point the river runs southeast, flowing through Forrest, Perry, and Greene Counties.

The Pascagoula River is formed by the junction of the Leaf and Chickasahay Rivers and flows slightly east of a southerly direction, emptying into Mississippi Sound through two mouths, known as East and West Pascagoula Rivers. They are each about 40 miles long and empty into the sound about 3 miles apart, the Eastern Fork emptying into the sound at Scranton, and the western mouth at West Pascagoula, Miss. The Eastern Fork is much the better river, and is the one referred to throughout this report, it being the portion that is under improvement at the present time.

Previous examinations and surveys.—Report of a preliminary examination of Leaf River may be found in Annual Report of Chief of Engineers for 1889, page 1462. It is recommended in this report that a high-water channel for five months in the year may be formed by the removal of snags, logs, and overhanging trees at a cost not to exceed $25,000.

Preliminary examination report of Pascagoula River is on page 835 of Annual Report of Chief of Engineers for 1879. In this report it is estimated that $14,000 will be needed to remove the obstructions from Pascagoula River between its source and the mouth of Dog River.

History of improvement, appropriations, and expenditures.—The following is an extract from the Annual Report of the Chief of Engineers for 1909 (not yet printed):

"*Pascagoula River (above the mouth of Dog River).*—Before this improvement was commenced navigation was impossible on this section of Pascagoula River, except during period of high water. The minimum width of the channel was 60 feet and the minimum depth was 1 foot at mean low water, the stream being very much obstructed by snags and logs. The first project for this improvement, which was adopted in 1880, in addition to providing for dredging work at the mouth of the stream, described in the report on the improvement of Pascagoula River, Miss., contemplated the improvement of the river by the removal of snags and overhanging trees. Under this project the river was cleared of obstructions between 1882 and 1884, at a cost of $15,000. In 1886 the existing project for this improvement was adopted. This project provided for the maintenance of the channel above the mouth of the river by the removal of obstructions from the stream from time to time, but was modified in 1899, the extent of the improvement being limited at that time to the section of the river above Dog River, about 100 miles. The total amount expended on the existing project to June 30, 1909, was $29,380.97 all of which was applied to maintenance.

"On June 30, 1909, the Pascagoula River was navigable at low water for boats of 5-feet draft as far up as Cedar Creek, 55 miles, while above this point to the head of the river light-draft navigation was possible on a slight rise above low water.

"The Pascagoula River is nontidal, except in its lowest reaches.

"The report of the examination upon which the improvement was originally based is printed in the Annual Report of the Chief of Engineers for 1879, page 835.

"*Leaf River.*—Originally it was impracticable to navigate the river on account of snags, logs, and overhanging trees obstructing the channel. The minimum width of the stream was 100 feet and the minimum depth was 2½ feet at mean low water. The original project for this improvement was adopted in 1890, its purpose being to afford a channel for high-water navigation from Bowie Creek to the mouth of the river, a distance of 75 miles, by the removal of obstructions and overhanging trees. This project was completed in 1897 at a cost of $11,019.04, since which time expenditures have been in the direction of maintaining the improvement.

"The total amount expended on this improvement up to June 30, 1909, was $23,146.01, of which $12,126.97 was applied to maintenance. On June 30, 1909, the river was available for rafting on a fair rise above low water, being used to a very limited extent for any other form of navigation."

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APPROPRIATIONS.

Pascagoula River, Miss.

Total to Dec. 31, 1902 (included in those for Pascagoula River shown on p. 283 of H. Doc. No. 421, 57th Cong., 2d sess., see also report immediately preceding this one)	$31,000
June 13, 1902 (allotment)	4,000
Mar. 3, 1905 (allotment)	6,750
Mar. 2, 1907 (allotment)	6,000
Total	47,750

Leaf River, Miss.

Total to Dec. 31, 1902 (as shown on p. 283 of H. Doc. No. 421, 57th Cong., 2d sess.)	19,750
Mar. 3, 1905	3,250
Mar. 2, 1907	2,500
Total	25,500

Physical characteristics.—The gasoline launch *Naomi* was used in making an examination of the present condition of these streams. This launch has a length of 33 feet, a breadth of 12 feet, and a draft of 3 feet. It was sent up by water from Scranton to Hattiesburg where the inspection was commenced, on the 10th of August, 1909, and continued downstream until the evening of the 13th of August when the mouth of Dog River was reached. Soundings were made at regular intervals and the results are shown on the accompanying sheet.[1] Generally where the shoals are represented deeper water could have been found to one side or the other, but it could not be followed on account of snags and logs. The banks of these rivers vary in quality of material from a light sandy soil that washes and caves easily to a stiff clay that stands upright. In height they vary from 10 to 40 feet above low water, except near the lower portion of the Pascagoula where the banks are flat and marshy. From the mouth of Bowie Creek to a point about 30 miles below, Leaf River is filled with snags and logs and gravel bars. No sooner does a bar end on one side of the river than another begins on the opposite side. As is the general rule in such rivers, at the upper and lower ends of these bars is where the shoalest water occurs. The banks over this portion are not stable and each overflow brings large numbers of obstructions into the stream. It is claimed that after the removal of snags and logs deeper water would form, and generally no doubt this would be the case. There are numerous sharp bends.

The remainder of Leaf River and all of Pascagoula River are in fair condition considering the small amount that has been expended and the length of time since any work has been done. In some places several miles of river exist where there is deep water, free from snags. The width of Leaf River at low water varies from 100 to 350 feet, and that of Pascagoula River, from 150 to 500 feet. The lower 50 miles of Pascagoula River are in good condition. There are 152 sand and gravel bars on Leaf River below Hattiesburg and 94 on Pascagoula River.

From Bowie Creek down to Cedar Creek the banks on either side are lined with forests of oak, gum, hickory, ash, and other hardwoods and further off are vast forests of pine.

The following table gives the tide gauge readings as indicated on United States Weather Bureau gauges at Hattiesburg and Merrill, Miss., the latter point being just below the mouth of Leaf River, and also the lowest readings recorded during the years 1905–1908 and the mean during the low-water months of those years as furnished by the United States Weather Bureau at Meridian, Miss.:

HATTIESBURG, MISS.

Date.	Mean reading.	Lowest recorded.
September, 1905	3.4	
October, 1905	3.6	2.5
November, 1905	3.4	
November, 1906	3.3	2.8
November, 1907	4.1	2.8
November, 1908	2.5	2.2
Aug. 10, 1909	[2] 4.15	.....

[1] Not printed. [2] Reading.

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MERRILL, MISS.

Date.	Mean reading.	Lowest recorded.
August, 1905	6.6	
September, 1905	2.3	1.2
October, 1905	2.3	
November, 1905	2.1	
August, 1906	2.9	
September, 1906	4.4	1.6
October, 1906	13.7	
November, 1906	3.6	
August, 1907	7.2	
September, 1907	5.7	1.3
October, 1907	2.6	
November, 1907	5.2	
August, 1908	5.3	
September, 1908	2.2	.5
October, 1908	.9	
November, 1908	1.0	
Aug. 13, 1909	6.33	.....

[1] Reading.

Freshets are of usual occurrence, and each brings into the stream large quantities of snags and logs. At Merrill just below the mouth of Leaf River an average of three overflows occurred per year during the past four years. It is therefore not surprising that navigation is impossible or dangerous on the Leaf and upper part of the Pascagoula Rivers, as such a comparatively small amount of work has ever been done on these streams.

In addition to the snags and trees brought into the river by each overflow, large quantities of loose saw logs are floated out of the swamps and lowlands where they have previously been cut for this purpose and allowed to drift down the river to some sawmill in this condition. Large numbers of these logs sink, and form obstructions in the river. Many more lodge against the bank and are left there when the water recedes.

From Bowie Creek to the mouth of Leaf River there are 10 fixed bridges as follows:

Name.	Place.	Kind.	Height above water.	Remarks.
			Feet.	
Bowie Creek Bridge	Forrest County, at Hattiesburg.	Steel, county bridge	26.6	
New Orleans & Northeastern R. R.	do	do	26.1	
River Avenue Bridge	do	do	28	Center pier in middle of river.
McCallum Bridge	Forrest County	do	25½	About 20 miles below Hattiesburg.
Choctaw Bridge	Perry County	do	24	About 35 miles below Hattiesburg.
New Augusta Bridge	do	do	29½	About 43 miles below Hattiesburg.
Windgate Bridge	do	do	29½	About 52 miles below Hattiesburg.
Mobile, Jackson & Kansas City R. R. Bridge.	do	Steel	30½	About 68 miles below Hattiesburg.
Beaumont County Bridge.	do	Steel, county bridge	26½	Do.
McLain Bridge	Greene County	do	31½	About 83 miles below Hattiesburg.

There is a railroad bridge across the Pascagoula River at Merrill, but it has a draw span which is being repaired so it will be in operation in a short time.

The length of Leaf River below the mouth of Bowie Creek is considered in this report to be 100 miles.

With the probable exception of the first three, which are at the upper end of the improvement, all of these bridges would of course have to be removed or provided with a draw span in order to permit of the passage of commerce.

Resources, industries, and commerce.—Leaf and Pascagoula Rivers run through a fertile country in the infancy of development. The forests along these rivers are still

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filled with a large quantity of fine timber. As the forests are cleared, the land is being put into cultivation, and with the assistance of a little fertilizer raises large crops of cotton, corn, fruit, vegetables, sugar cane, oats, and potatoes.

Situated at the mouth of Bowie Creek, on Leaf River, is the town of Hattiesburg, a railroad center, with a population of 15,000. Within this town there are a number of industries, chief among which are several large sawmills, one of which is one of the largest in the South, a cotton compress, a large fertilizer factory, and other minor plants. The large number of county bridges bear evidence of the country being settled below this point.

At the lower end of the improvement is Pascagoula, a shipping port where the General Government has formed a channel with a depth of 17 feet. A large number of people and fertile extensive territory would be affected by the proposed improvement. As the difference in shipping direct by water and by rail would be considerable, the people along these streams desire that their principal products be shipped direct by water. The country tributary to the Leaf and Pascagoula Rivers is traversed by only one railroad, the Mobile, Jackson & Kansas City, and it only runs through a portion of this country.

Following is a tabulated statement prepared from data furnished by commercial bodies at Hattiesburg and Pascagoula, showing the present annual commerce by river and the amount shipped by rail that could be shipped by river if it were navigable.

Commerce on the Leaf River for the calendar year 1908.

Kind.	Tonnage.	Value.
General merchandise	60	$2,000
Logs	202,500	600,000
Hewn timber	10,800	36,000
Total	213,360	638,000

Commerce on Pascagoula River (above mouth of Dog River) during 1908.

Kind.	Tonnage.	Value.
Logs, timber, crossties, etc	272,027	$1,372,500
Turpentine	300	37,500
Rosin	1,000	22,500
Charcoal	12,000	150,000
General merchandise	5,000	225,000
Total	290,327	1,807,500

Shipped by rail annually that could be shipped by river from Hattiesburg.

Kind.	Tonnage.	Value.	Remarks.
Cotton	25,000	$5,000,000	100,000 bales.
Wool	138	82,500	
Hides	234	6,800	
Lumber [1]	200,000	1,000,000	100,000,000 feet board measure.
Total	225,372	6,089,300	

[1] This only includes that originating in Hattiesburg, 50 per cent of which is cut for export.

It is claimed that $150,000 could be saved annually on the lumber and cotton above originating in and around Hattiesburg if navigation were possible on the Leaf and Pascagoula Rivers.

Besides this, it would seem that Hattiesburg is greatly discriminated against in the way of freight rates. As stated by the secretary of the Hattiesburg Commercial Club, "The Illinois Central Railroad has been in position to dictate rates owing to the fact that the lines which would be willing to put Hattiesburg on a parity with Jackson and Meridian receive their inbound freight from the Illinois Central. This discrimination according to traffic sheets in force is as follows:

"From New York to Hattiesburg, via New Orleans, is $1.16.

"From New York to Meridian, via New Orleans, is $0.96.

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"This freight is hauled through Hattiesburg to Meridian a further distance of 85 miles, making a discrimination of 20 cents per hundred, first class, and the second, third, fourth, and fifth class rates carry a corresponding discrimination.

"Taking a common point like Cincinnati, where the distance to Hattiesburg and Meridian are the same, and which based on all other rates, to cities of the same class would put Hattiesburg and Meridian on the same basis, the rates are as follows on the following classes and commodities:

	Hattiesburg.	Meridian.		Hattiesburg.	Meridian.
First class	$1.26	$1.06	Fourth class	$0.78	$0.66
Second class	1.09	.92	Fifth class	.64	.55
Third class	.93	.78	Sixth class	.54	.48

"The commodity rates, car-load lots, on the following commodities discriminate as follows:

	Hattiesburg.	Meridian.	Difference.
Canned goods, per hundred	$0.50	$0.41	$0.09
Farm implements	.54	.48	.06
Cotton bagging and ties	.36	.31	.05
Fruit jars	.52	.43	.09
Grain and grain products	.25	.205	.045
Flour	.285	.23	.055
Iron and hardware	.35	.29	.06
Meats and poultry, dressed	.62	.50	.12
Packing-house products	.395	.345	.05
Sewer pipe	.25	.20	.05
Plaster	.26	.21	.05
Stoves	.59	.50	.09
Tobacco	.93	.76	.17
Live stock, per car	126.00	106.00	20.00

"It is admitted that if the river were improved so that we could adjust the rates from New York, via New Orleans, Hattiesburg could be immediately relieved of the discrimination above set forth, resulting in a saving of at least $150,000 per annum on commodities affected by these rates."

Complete statistics could not be obtained but enough has been shown to warrant the statement that the proposed improvement means a great deal to the inhabitants along these rivers, especially to the people of Hattiesburg.

Nature of improvement desired.—The commercial interests desire a channel with a depth of 6 feet and a width of 60 feet, although they state that if this were too costly a channel with a depth of 4 feet would be of great benefit. Basing their opinion, however, upon information furnished by men who have had considerable experience on these rivers, they believe that a channel with the desired depth can be obtained principally by active snagging operations, combined with a small amount of dredging through the worst shoals.

Special subject of inquiry.—None of the special subjects mentioned in the act would be affected by the proposed improvement.

Conclusions.—The proposed improvement would cause a reduction of about 20 per cent in freight rates. The inhabitants of a large extent of fertile country would be greatly benefited. The cost of the improvement would no doubt be overbalanced by the saving to the people annually. As the present high-water channel will not answer the demands of commerce, it is respectfully recommended that a survey be made and plan and estimate of cost prepared for obtaining a low-water channel, with suitable depth and width. It is estimated that $8,000 would be needed for this purpose.

All papers and data obtained in the investigation of this subject are transmitted herewith.

Very respectfully submitted.

J. M. PRATT,
Assistant Engineer.

Maj. H. JERVEY,
Corps of Engineers.

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SURVEY OF LEAF AND PASCAGOULA RIVERS, MISS.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., September 30, 1911.

SIR: 1. I have the honor to submit the following report on the survey of Leaf and Pascagoula Rivers, from the mouth of Bowie Creek to the junction of Pascagoula and Dog Rivers, directed by letter from the office of the Chief of Engineers, dated November 18, 1909. This survey was directed in the river and harbor act of March 3, 1909. Tracings of the survey, showing profile and topography in 114 sheets, are submitted herewith.[1]

2. Report on the preliminary examination of these rivers was submitted by Maj. Henry Jervey, Corps of Engineers, under date of October 11, 1909, and attention is invited to his report for information relative to commercial statistics, railroad rates, and general description of the streams.

3. For consideration of this report, the Board of Engineers for Rivers and Harbors requested that a survey be made and that estimates be prepared for—

(*a*) Prosecuting the work vigorously under the existing project, with a view to clearing the river of snags and obstructions.
(*b*) A channel of suitable width and 4 feet in depth.
(*c*) A channel of suitable width and 6 feet in depth.

4. A preliminary party was sent out in December, 1909, to locate bench marks, during the then low-water season. Actual survey began May 18, 1910, at the junction of Bowie Creek and Leaf River, 1 mile above Hattiesburg, Miss. The survey party consisted of three instrument men, five recorders, and the necessary number of boatmen, laborers, etc. It was provided with a quarter boat and five skiffs, and was successively in the charge of Messrs. Truman A. Smith, junior engineer; J. D. Ferguson, inspector; and C. A. Turrell, surveyor. The field work was completed October 26, 1910, at Moss Point, Miss., and the preparation of maps and reports was completed May 26, 1911. Some delays occurred, due to rises in the river and to sickness of members of the party. The total cost of the survey was $10,567.86. Mr. J. M. Pratt, assistant engineer, was in general charge of this survey, and extracts from his report and from that of Mr. C. A. Turrell, surveyor, are attached hereto.

5. Summary of the estimates prepared under the headings desired by the Board of Engineers for Rivers and Harbors is as follows:

(*a*) Completion of present project in two years:	
Work of improvement	$87,000
Annual maintenance	12,000
(*b*) For a 4-foot channel, 75 feet wide:	
Estimate No. 1, based on dredging by contract—	
Work of improvement	248,560
Annual maintenance	25,000
Estimate No. 2, based on executing dredging with combined Government plant, equipped for snagging and dredging—	
Work of improvement	110,500
Annual maintenance	15,000
(*c*) For a 6-foot channel, 75 feet wide:	
Work of improvement	485,200
Annual maintenance	90,000

[1] Index map only printed.

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It would, of course, be practicable to secure suitable navigable widths and depths on the rivers by canalization, but the cost thereof is prohibitive. The above estimates contemplate clearing the streams of snags and obstructions, dredging channels through the bars to a suitable depth, and maintaining the water levels and navigable velocities in these channels by small spurs and dikes.

6. The physical data in the accompanying reports show a very regular fall in the streams, diminishing toward the lower portion. The following table shows the two streams, divided into sections of approximately equal length, numbered downstream from Bowie Creek, and gives lengths, slopes, average widths, and theoretical uniform velocities for these sections. The velocities are computed by Kutter's formula, assuming $n = 0.03$. This value is taken from similar conditions on other streams, as data are not available for its determination on Leaf and Pascagoula Rivers. Corresponding values of C vary from 65 to 67 for the 4-foot depth and from 69 to 77 for the 6-foot depth.

Section.	Length.	Fall.	Fall per 1,000 feet.	Low water, average width.	Low-water velocity.	
					6 feet.	4 feet.
	Feet.	*Feet.*		*Feet.*		
1	58,000	9.8	0.19	180	2.35	1.78
2	58,000	9.0	.18	180	2.32	1.72
3	58,000	18.0	.36	190	3.22	2.43
4	59,000	11.0	.19	200	2.35	1.78
5	56,000	8.0	.14	220	2.05	1.52
6	50,000	8.4	.17	220	2.23	1.65
7	56,000	10.0	.18	230	2.32	1.72
8	56,000	7.8	.14	250	2.05	1.52
9	48,000	6.4	.13	260	1.95	1.45
10	56,000	8.0	.14	300	2.05	1.52
11	58,000	5.8	.10	300	1.75	1.30
12	48,000	4.9	.10	300	1.75	1.30
13	56,000	.6	.011	350	.64	.43
14	56,000	.8	.015	350	.74	.59
15	42,000	.2	.005	350	.53	.38

These velocities presuppose complete regulation throughout each section, which is unattainable, but it is not believed that velocities obtainable by regulation at shoals would exceed those of the table in any section by more than 75 per cent, which would be entirely practicable for navigation. The maximum velocities computed indicate a low-water discharge on Leaf River for a 6-foot channel of 1,350 foot-seconds and for a 4-foot channel of 730 foot-seconds. A measured discharge on Leaf River with gage +0.2 have 828 foot-seconds. From these figures it appears probable that a 4-foot depth could be maintained by regulation works, but gives rise to grave doubts as to whether a 6-foot depth could be maintained in a 75-foot channel. The steepest slope on any shoal on these streams shows a fall of 2 feet in 2,000 feet.

7. A public hearing was held at Pascagoula, Miss., in the matter of this improvement on July 28, 1911, at which representatives of the various interests on the river were present. The lumber representatives were unanimous in expressions of willingness to abandon log driving and sack rafting on the streams if these could be properly improved. The county authorities expressed their readiness to make suitable alteration in existing bridges. The commercial interests of Hattiesburg pledged themselves to maintain a traffic

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line on the improved river, and to provide permanently free public landing places at Hattiesburg and Merrill. It was apparent at the hearing that the demand for suitable improvement is great on these streams, based in the order of importance on (1) obtaining better transportation rates by the use of the river and by competition with the railroads, (2) a suitable depth and clear river for all-year rafting of logs, (3) obtaining a transportation line for the settlement and development of the cut-over timber lands now going to waste in the valley.

8. I believe that the streams are worthy of improvement by the United States to a limited extent, and recommend the adoption of the 4-foot project (Estimate No. 2). If adopted, funds should be made available for early completion, as the improvement will be of little or no value until continuous throughout. The work should begin at Hattiesburg and be carried downstream. Proper regulation for logging should be promulgated and follow the improvement, being effective at all times above the lower limit of the improved river and noneffective below that point, in order that log driving may not be suspended until the river is in suitable condition for rafting.

9. In my opinion the most economical method of work would be to complete the same in two years, involving an initial appropriation of $75,000 for the construction of plant and about six months operation, and an appropriation the following year of $35,500 to cover the remainder of the estimate. I would recommend that any enactment making appropriation under this project contain a proviso that no expenditure shall be made until the cities of Hattiesburg and Merrill have made provision for suitable permanent public landings at those places. All necessary changes in the bridges spanning the streams can be effected by the War Department during the two years of construction, by action under existing statute law.

10. If this project, or some other involving channel excavation and regulation, is not adopted for these streams, I recommend that work thereon be abandoned, as the present project produces little if any beneficial results, is a useless expenditure, and the estimated cost thereof is about 79 per cent of that of the project recommended.

11. There are no wharves or terminal facilities on these streams at present, as no occasion has arisen for their use, nor are there any mechanical appliances for handling freight. There is ample available space for wharves and landings at towns on the river, and provision should be made, as recommended above, for the reservation of suitable space for these purposes.

12. There has been no demand for water power along these streams. If a lock and dam system should ever be established it is unlikely that the water power developed would prove of much value, owing to the uniform slope and the probable advantage of low lifts, uneconomical for the generation of power.

13. Flood regulation is not deemed necessary on these streams, nor is it thought that the projected improvement will directly benefit adjacent lands.

Respectfully submitted.

C. A. F. FLAGLER,
Major, Corps of Engineers.

The CHIEF OF ENGINEERS, UNITED STATES ARMY
(Through the Division Engineer).

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[First indorsement.

OFFICE DIVISION ENGINEER, GULF DIVISION,
New Orleans, La., October 23, 1911.

1. Respectfully forwarded to the Chief of Engineers, United States Army.

2. A stream like the Leaf and Pascagoula Rivers consist of a series of pools and steeper portions. Kutter's formula when applied to a stream of this kind must necessarily give lower velocities than will be actually found locally at many points, and it is fair to believe that the velocities shown in the table will be actually considerably exceeded. The steeper portions, or shoals, are now formed largely by material lodged upon stumps or logs. Were these logs and shoals removed new shoals would form differing only somewhat in the character of the material. It is believed that if channel excavation and regulation be adopted at one point it will only remove the difficulty at that particular place and transfer it to some point a little farther downstream. Paragraph 10 of the report indicates the results which have been secured to date, and it is probable that similar results would follow channel excavation and regulation unless the work be done on an extravagant scale.

3. It does not appear to the division engineer that the commerce involved will justify the large expense necessary to do this work, and on this account the locality is not recommended for approval.

LANSING H. BEACH,
Lieut. Col., Corps of Engineers,
Division Engineer.

[For report of the Board of Engineers for Rivers and Harbors on survey, see page 3.]

REPORT OF ASSISTANT ENGINEER J. M. PRATT.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Mobile, Ala., May 26, 1911.

SIR: 1. In compliance with your directions, I have the honor to submit the following letter descriptive of a survey of Leaf and Pascagoula Rivers made in accordance with instructions contained in department letter dated November 18, 1909.

2. Owing to the numerous swamps and large forests bordering these rivers, and the distance to be covered in a single low-water season, making it necessary to proceed at the rate of 1 to 2 miles per day, it was considered impracticable for the party to live ashore in camps, as their outfit would have to be hauled every two or three days and even then the party would be working at a disadvantage. A quarter boat was therefore constructed by hired labor during the spring of 1910 at Hattiesburg, the upper limit of the survey, and everything was in readiness to commence work at the beginning of the low-water season. The total cost of the construction of this boat was $906.77. The hull was strongly built and of such shape that after the completion of the survey, by removing the house, it could be used as a tender for a snagboat. This hull will be used during the coming low-water season by the snag boat *Escatawpa* which will operate on Leaf River. * * *

The survey was authorized in November, 1909, the latter part of the low-water season, too late to make the necessary preparations and commence work. Enough time, however, remained to obtain the elevation af the low-water surface from Hattiesburg to the mouth of Dog River, which was done by setting bench marks 4 or 5 miles apart, the elevations of which were referred to the water surface. At the same time records were obtained of the elevation of the water surface at Hattiesburg and Merrill as referred to the United States Weather Bureau gauges at those points. This data enabled the reduction of soundings to be made to the plane of mean low water

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as established from records of several years kindly furnished by the United States Weather Bureau office, Meridian, Miss. At the beginning of the survey a tide gauge was set, the zero of which corresponded with the mean low water on the Hattiesburg gauge (U. S. Weather Bureau). This gauge was shifted from day to day as the party advanced, all soundings being reduced from it to the mean low-water plane, the bench marks previously set being used in checking it.

3. The plane adopted represented the average of the lowest readings as recorded by the United States Weather Bureau for the years 1905, 1906, 1907, 1908, and 1909 at Hattiesburg and Merrill which was 2.5 feet on the gauge at the former and 1 foot on that at the latter place as shown below:

Lowest recorded readings.

Year.	Hattiesburg.	Merrill.
	Feet.	*Feet.*
1905	2.5	1.2
1906	2.8	1.6
1907	2.8	1.3
1908	2.2	.5
1909	2.5	.6
Mean	2.5	1.0

This is sufficiently low in elevation, as the records show that the average height of the water during the low-water months for 1905 to 1910 was as follows:

Year.	Hattiesburg.				Merrill.			
	August.	September.	October.	November.	August.	September.	October.	November.
1905	4.6	3.4	3.6	3.4	6.6	2.3	2.3	2.1
1906				3.3	3.0	4.4	13.7	3.6
1907				4.1	7.2	5.7	2.6	5.2
1908				2.5	5.3	2.2	.9	1.0
1909				2.6	5.4	3.1	1.6	1.0
1910	2.8	2.4	2.7	2.7	2.7	.9	1.2	1.1
Mean	3.7	2.9	3.1	3.1	5.0	3.1	3.7	2.3

No records were obtained at Hattiesburg during August, September, and October, 1906, 1907, 1908, and 1909. During the four months of the six years covered by the records as shown above the water surface was below the adopted plane only 20 days at Hattiesburg and 98 days at Merrill, and during the entire time, as far as the records show, only 21 days at Hattiesburg and 104 days at Merrill. Therefore the soundings on the accompanying maps indicate the depths available practically throughout the year. These rivers are subject to considerable and rapid fluctuations. The lowest and highest waters recorded from 1905 to 1910 are as follows:

Year.	Hattiesburg.				Merrill.			
	Lowest.	Date.	Highest.	Date.	Lowest.	Date.	Highest.	Date.
1905	2.5	Jan. 4–5	20.5	Jan. 12	1.2	Sept. 30	23.4	Feb. 15.
1906	2.8	Nov. 8, 9, 13.	20.1	Mar. 21	1.4	Sept. 19	21.6	Mar. 25, 26.
1907	2.8	Apr. 4–6; Nov. 15–17.	19.8	May 18	1.3	Oct. 27, 31; Nov. 1.	21.8	May 21.
1908	2.3	Nov. 27–30; Dec. 1.	18.6	Feb. 16	.5	Oct. 21, 23	21.4	Feb. 20, 21.
1909	2.5	Nov. 1–2, 10–14, 18–19.	18.7	June 5	.6	Nov. 5, 8, 9, 10.	25.1	June 4.
1910	2.2	Nov. 1–5	11.5	May 21	.0	Nov. 2, 3, 4, 5.	15.7	July 8.

4. The field work of this survey was commenced on May 23 and completed October 24, 1910. The preparation of the final maps was not completed until April 4, 1911, and the compilation of estimates was not completed until the present time, as it was

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considered desirable to have this part of the work done by the present office force whose time was partly taken up by other work. The cost of making this survey is as follows:

Cost of construction of quarter boat and 5 skiffs	$906.77
Cost of furnishings, bedding, etc., for quarter boat	501.51
Cost of field work of survey	7,186.95
Cost of office work and superintendence (with the possible exception of a few small bills)	1,972.63
Total	10,567.86

Number of miles of river covered by the survey, 160.96.
Total cost of survey per mile, $65.66.

The elevation of all contours and benchmarks on the accompanying maps are referred to mean low water in Mississippi Sound as established by the Coast and Geodetic Survey in 1885–86.

5. The work in the past on these rivers has been confined to the removal of obstructions and this could not be prosecuted vigorously and continuously during the low-water seasons on account of small appropriations. Up to the past season nothing but a small hand-power boat had ever worked on Leaf River and the Pascagoula River was only worked over occasionally. During the past year a small snag boat with steam capstan was constructed for work on the Leaf River. The comparatively small amount expended on each stream up to the present time is shown below:

LEAF RIVER.

Amount expended from 1890 to 1911	$29,699.08
Amount expended per year	$1,484.95
Length of river under improvement, miles	78.86
Amount expended per year per mile (about)	$19.00

PASCAGOULA RIVER.

Amount expended from 1882 to 1911	$51,476.64
Amount expended per year	$1,838.45
Length of river under improvement, miles	82.10
Amount expended per year per mile	$22.50

As these rivers flow through an almost unbroken forest, with each shifting of the bed there is a caving of trees. In addition to this, no system of rafting has even been followed. The timber men have always simply rolled their logs into the river, and those that did not sink and were not carried into a run out by an unusual freshet or left upon the bank by a sudden fall found their way to the mills at Moss Point, at the mouth of Dog River. The banks and beds of these streams, Pascagoula River in particular, are lined with saw logs. Every run out is filled with them. They are everywhere an evidence of reckless waste, wrong ideas of economy, and an utter disregard of the damage to a public waterway. It is believed that the only method of floating logs on these streams should be by the formation of rafts, each end of every log of which shall be properly secured. It is hardly possible to keep these rivers open for steamboat navigation even, at any cost, while the present method of floating loose logs is permitted. Therefore, on account of these two causes, namely, the bringing of trees into the streams by freshets and the method of floating logs, and principally the latter, the amounts appropriated in the past have been entirely inadequate to keep these rivers clear of obstructions. During a portion of the past low-water season two snag boats were working on these streams. From July 27 to December 23, 1910, the snag boat *Demopolis* worked upstream in Pascagoula River from Dead Lake to a point 20½ miles above, accomplishing the following:

Overhanging trees:	
Felled and cut up	5
Felled and pulled back	20
Trimmed	3
Logs cut up	1
Removed from river:	
Stumps	96
Snags	676
Logs	854
Trees	2
Piles	2
Cost of doing the above work	$4,556.05

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The snag boat *Escatawpa* was constructed in the summer and fall of 1910, and from October 24 to December 31 she worked downstream over a distance of 7 miles, commencing at Hattiesburg. The work accomplished by this boat is as follows:

Logs removed from drift piles	25
Removed from river:	
Stumps	111
Snags	370
Logs	252
Cost of above work (including fitting up of boat)	$3,095.39
Cost of construction of snag boat	$3,257.68

Both of the above boats are nonpropelling, but have steam capstans. The snag boat *Escatawpa* was especially constructed so as to pass under the bridges on Leaf River at ordinary stages. It was noticed that no sooner were the logs and snags removed from a shoal than it would commence to deepen.

6. Some of the facts ascertained by the survey which may have some bearing on this subject are briefly stated below:

Distance by river from Hattiesburg to mouth of Leaf River	miles	78.86
From mouth of Leaf River to mouth of Dog River	do	82.10
Total distance from Hattiesburg to mouth of Dog River	do	160.96
Fall in Leaf River below Hattiesburg	feet	93.96
Fall in Pascagoula River	do	31.07
Distance above Dog River that the Pascagoula River is affected by ordinary tides	miles	32.00
Navigable depth over this distance	feet	8.00

Number of shoals in these rivers where there is a less mean low-water depth than 4 feet, 181.

Character of material forming these shoals, logs, snags, sand, and gravel.

Character of banks fairly stable, consisting principally of sandy loam and clay.

Least mean low-water depth along channel line 1.4 feet.

Discharge per second.

Locality.	Mean low water.	Extreme low water.
	Feet.	*Feet.*
Leaf River:		
At Hattiesburg	840	650
At its mouth	1,170	700
Pascagoula River at Merrill	1,960	1,080

Velocity.

Locality.	Water surface referred to mean low water plane.	Maximum velocity per second.
	Feet.	*Feet.*
Leaf River:		
At Hattiesburg	− 0.5	2.18
At its mouth	− .7	1.51
Do	+ 9.0	2.30
Pascagoula River at Merrill	− .7	1.91
Do	+11.0	3.55

	Feet.
Average width of Leaf River	150 to 200
Average width of Pascagoula River	200 to 350

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The number, location, height, and clear opening of fixed bridges across Leaf River are as follows:

Name.	Distance below Bowie Creek.	Height above mean low water.	Clear opening between piers.	Location of piers.
	Miles.	*Feet.*	*Feet.*	
County highway	0	26.5	200	Edge of banks.
New Orleans & Northeastern R. R.	$\frac{3}{4}$	29.0	205	Do.
County highway	$1\frac{1}{4}$	25.3	140–175	Edge of banks and near center of stream.
Do	$16\frac{1}{4}$	25.8	215	Near each bank.
Do	$28\frac{1}{2}$	27.3	205	Near either bank.
Do	$33\frac{1}{4}$	31.3	150–170	One on either bank; center one on sand bar.
Do	$39\frac{3}{4}$	34.2	215	On either bank.
New Orleans, Mobile & Chicago R. R.	$47\frac{1}{2}$	33.6	195	Do.
County highway	$47\frac{3}{4}$	27.5	215	Do.
Do	$60\frac{1}{4}$	34.7	220	Do.

All of the above, with the exception of the upper two, which are right at Hattiesburg, or perhaps the upper three, the lower one being only 1 mile below, would have to be provided with draw spans before steamboat navigation could be carried on.

The nearest railroad to Leaf River is the New Orleans, Mobile & Chicago. It parrallels the river, and is from $\frac{1}{4}$ to $2\frac{1}{2}$ miles from it all the way from Hattiesburg to Merrill. This railroad crosses Pascagoula River at Merrill, and is joined at Evanston, a few miles east of Merrill, by the Pascagoula Northern Railroad, which runs south to Pascagoula, Miss. The average distance of this road from the Pascagoula River is from 8 to 10 miles.

7. From deep water in the Gulf of Mexico to the mouth of Dog River, a channel has been formed by the Government having a mean low-water depth of 17 feet. From the mouth of Dog River to Dead Lake, a distance of 32 miles, there is a channel 8 feet deep over a navigable width. There is a minimum low-water depth over a navigable width between the latter point and Hattiesbrug of 1.4 feet; the distance is 129 miles, and the lift or difference in elevation of the mean low-water surface is 123.03 feet. The cost therefore of making slack-water navigation possible is so great that it is not considered here. It would probably be in excess of $3,000,000.

The question now suggests itself as to whether the prospective commerce demands an improvement of 129 miles of river where the maintenance will necessarily be great, and if so to what extent. The best way can not always be followed, even in the details, on account of cost. The deciding factor is the question of economy, and if it is found that enough can be accomplished to obtain certain results justified by the cost, even though the demands are only partially met, it may be accepted instead of the more costly method which, while meeting the demands entirely, is too expensive as compared with the benefits derived. There are some very sharp bends in Leaf River, but it is believed that with the proper depth boats of suitable size can follow them. As these rivers have a comparatively regular slope, being broken only by a series of small steps, the steepest of which is a fall of 2 feet in 2,000 feet, and as they have fairly stable banks it is believed that the depth could be increased to some extent over the shoals by the proper constructing and placing of jetties. The slope in the upper portion of Leaf River is however much greater than it is near its mouth or in Pascagoula River, and the results obtained by contraction would not be as great near Hattiesburg as they would near the mouth of the Leaf or in the Pascagoula River. However, some improvement could be obtained all along, and this, coupled with the increase in depth due to the removal of snags and logs, it is believed would give an average available depth during the low-water months of 4 feet, which would be ample for steamboat navigation during the greater part of the year.

On some of the shoals worked over on these rivers during the past season it was noticed that the depth was increased as much as 1 foot simply by the removal of snags and logs. The bed of the stream is composed generally of sand and gravel, which shifts very rapidly when not supported by snags and logs and when the force of the current is properly applied. Great care would have to be exercised as to the extent of the contraction work at the various shoals, as too much contraction would be worse than none. The jetties should in most cases extend a very short distance into the stream and should be only from 1 to 2 feet above the mean low-water plane. As there

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is no rock available along these streams for the construction of jetties, and their construction with piling or cribs or mattresses would be very costly, it is believed that by piling the sunken logs and snags and trees, especially those having limbs on them, along the line of jetty, driving a few piling where necessary to hold them, and pumping sand and gravel on and between them, an economical and fairly substantial jetty could be built. In the first place the logs, trees, and snags taken from the bed of the stream by the snag boat would be water-soaked and would not float, and if enough are found with branches to them, no piling will be needed, as the roots and branches would sink into the sand and hold them, as they sometimes do in the middle of a stream, where they have been known to form an island. A second advantage would be that having these jetties near the shoals where the snags are most plentiful would make a convenient dumping ground for the snag boat. The third reason is that the material pumped from the shoal could be fully utilized.

8. Estimates have been made for the completion of the present project and for the formation of a channel 4 feet and 6 feet deep, having a width in either case of 75 feet in the Leaf and 100 feet in the Pascagoula River, with appropriate easements at sharp angles, and are given below:

COMPLETION OF PRESENT PROJECT.

Construction and equipment of two snag boats with steam capstans	$25,000
Cost of two barges	2,000
Cost of operating three boats two years in removing snags and logs (the *Escatawpa* now engaged on Leaf River with the two above)	60,000
Total	87,000

After the work is completed, it is believed that to keep the rivers clear of logs, snags, and trees will require the expenditure of about $12,000 per annum.

FORMATION OF A 4-FOOT CHANNEL.

Estimate No. 1.

Construction and equipment of one stern-wheel and two nonpropelling snag boats with steam capstans	$35,000
Construction of three attendant barges for these boats	3,000
Removal of logs and snags with four boats (one now on Leaf River) 1½ years	60,000
Cost of dredging a channel through the shoals to be 75 feet wide in Leaf River and 100 feet in Pascagoula, 1,088,000 cubic yards, at 12 cents	130,560
Cost of construction of jetties with brush and piling	20,000
Total	248,560

FORMATION OF 6-FOOT CHANNEL.

In addition to the amount of $98,000 for snagging and plant as shown above, in order to secure anything like a permanent channel, some form of locks and dams, vertical lifts, or inclines would have to be adopted, the cost of either of which would, it is believed, be prohibitive. However, the cost of the formation of the channel and the construction of jetties and removal of snags as shown for the 4-foot channel would be as follows:

Cost of plant and removal of obstructions and construction of only the jetties, as indicated for the 4-foot channel	$118,000
Dredging 3,060,000 cubic yards of material, at 12 cents per cubic yard	367,200
Total	485,200

The cost of maintenance of the 4-foot channel would be about $25,000 per year, and that of the 6-foot channel about $90,000 per year, and then it is doubtful if the latter could be kept open.

It is well to note, as before stated, that the beds of these rivers are composed principally of sand and gravel, which shifts easily and rapidly. Therefore ordinarily the shoals to a certain depth would be removed by snagging, by contraction work, or by a combination of the two. Those shoals that would require dredging in addition to the above would probably require constant maintenance work, or as a result of the improvement on these particular shoals a change would occur elsewhere, causing trouble. From the very great distance covered by the shoals that would have to

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be removed to form the 6-foot channel and the fact that some of these individual shoals are of considerable length and not a mere ridge across the river, and from the general outline of the streams, the condition of the banks and bed, the slope, discharge, and velocity, it is not believed that these rivers would maintain a 6-foot channel with navigable width. It is doubtful if a 4-foot channel could be maintained; that is of course on the assumption that the river was kept clear of all logs and trees. But it is believed that snag boats fitted with small centrifugal sand pumps could keep the 4-foot channel open in connection with maintaining it, while the maintenance of the 6-foot channel would require the constant service of a small dredge, and, as before stated, then it may not be kept open. In fact, if the channel formed is made 75 feet wide, the low-water discharge would not be ample to preserve a depth of 6 feet. If it is decided to actually dredge a channel through every shoal, it would probably be more economical to construct a small hydraulic dredge with a pump about 12 inches in diameter. In the case of the 6-foot channel, this would be decidedly the most economical, while the construction and operation of a dredge in the formation of the 4-foot channel would probably amount to the estimate as given, which is for contract work.

9. It would seem, however, that a considerable amount could be saved and fairly good results obtained by equipping each snag boat with a centrifugal sand pump of convenient size, about 8 inches in diameter, with the necessary dischage pipe. On each shoal where a jetty is desired, the snag boat could first construct the jetty of logs, trees and brush, and a few piling by using the material obtained in snagging, and then pump sand and gravel over it. The pump would need no cutter arrangement, as its suction would be sufficient to pick up all the material that could be forced through the discharge pipe. The suction would be fed by swinging it back and forth on the end of a boom. One or two such pumps are in use on snag boats in this district and have been used successfully in constructing dams across run-out bayous in Pearl River. If work is undertaken in this manner, the coast would be approximately as follows:

FORMATION OF A 4-FOOT CHANNEL.

Estimate No. 2.

Constructing and equipping one stern-wheel and two nonpropelling snag boats, having steam capstans	$35,000
Constructing three attendant barges for these boats	3,000
Purchase of four 8-inch centrifugal pumps with connections, discharge pipe, etc. (one for the boat already built)	5,000
Removal of logs and snags with 4 boats, 1½ years	60,000
Cost of extra time allowed for pumping sand and gravel on jetties and placing logs and trees already obtained by snagging, and driving a few extra piling where needed	7,500
Total	110,500

In all the estimates for construction of jetties it has been assumed that an average jetty 400 feet long and 4 feet high would be needed at every shoal. It is estimated that about one-half of the material forming these jetties would be sand and gravel, the other part being snags obtained from the river bed in the course of snagging work and some brush and piling. Of course its length and height would vary with every shoal perhaps, but it is believed that the above estimate will be sufficient for this style of jetty. In estimate No. 1 for construction of jetty for a 4-foot channel and for the jetty for the 6-foot channel the cost is greater than the above estimate, as it is proposed to use a large amount of piling and lumber, as there may be some question as to the use of logs, brush, and a few piling, as indicated for estimate No. 2, making a substantial jetty.

10. The number of boats that it is proposed to use on these streams may seem large, but it is believed that only by vigorous operations with a view to completing the work in a definite time, not too far distant, can any effective results be accomplished or steamboat navigation attracted. The three nonpropelling snag boats could each do as much work as the one fitted with self-propulsion in rivers like these, where obstructions are so numerous and moves of any distance very rare. As far as the actual snagging work is concerned they all may be nonpropelling, but some towing would probably be needed at times, or other work requiring long trips, and on this account it is considered advisable to have one self-propelling snag boat on these streams.

It is estimated that after the work of improvement is completed the maintenance work will require the service of two boats, properly fitted with pumps, removing obstructions and repairing jetties. The other two boats used in making the improvement would be needed to replace two old snag boats used elsewhere in the district

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which will probably be unfit for service by that time. Therefore the cost of the improvement would not be as great as shown by almost the full value of the boats.

11. As previously stated, there are 10 fixed bridges between the mouth of Dog River and Bowie Creek. All of these bridges are situated on Leaf River. As the upper three are within 1 mile of Hattiesburg, it is not believed that it would be necessary to install draw spans in them, and the limit of improvement might therefore only extend to the lower of these bridges, which is a county highway bridge called the River Avenue Bridge. This would eliminate one railroad and two county bridges. Of the remaining seven, one is a railroad bridge, crossing the river at Beaumont; the others belong to Forest, Perry, and Greene Counties. These bridges range in height above mean low water from 25.8 to 34.7 feet. It is therefore evident that draw spans will have to be put in before any steamboat navigation could be successfully accomplished or before any capital would be invested in it. It is believed that these changes will cost the people of the counties interested and the New Orleans, Mobile & Chicago Railroad Co. over $100,000. But as it is claimed that the improvement of these rivers would mean a least saying of $150,000 annually to the people (see preliminary examination report), the cost of making these changes would be quickly returned. It is therefore respectfully recommended that funds for the improvement be provided with the understanding that no work will be done until the required clear opening (70 feet is considered sufficient) be made in all these bridges.

* * * * * * *

13. Considering the benefits to be derived by the people along these rivers and the amount that can be accomplished even by vigorous snagging operations, it is believed that the saving to the people would justify the expenditure of the amount as shown in estimate No. 2 for the formation of a 4-foot channel. If, however, it is decided that these streams are not worthy of the provision of necessary funds for vigorous work, it is respectfully recommended that work on them be discontinued altogether, as the present rate of doing work under the small appropriations does little or no good.

As the people along the Leaf River, especially at Hattiesburg, would be the chief beneficiaries, it is believed that any project decided upon should be made continuous in depth from the mouth of Dog River to Hattiesburg. The total amount necessary to obtain a channel 4 feet deep as shown in estimate No. 2 is $110,500, and it is believed that it would be better were the entire amount appropriated at one time, though perhaps only enough could be expended the first year as would be necessary for the purchase of plant, construction of boats, and for their operation for six months, or about $63,000 if the above work is decided upon; but it is recommended that such appropriation be made with the understanding that no work will be done until the required clear opening is made in the seven bridges on Leaf River below Hattiesburg.

Very respectfully,

J. M. PRATT, *Assistant Engineer.*

Maj. C. A. F. FLAGLER,
Corps of Engineers.

REPORT OF MR. C. A. TURRELL, SURVEYOR.

MOBILE, ALA., *January 10, 1911.*

SIR: I have the honor to submit to you the following report of the results of the survey recently completed of Leaf and Pascagoula Rivers.

* * * * * * *

The Bowie River is a tributary of the Leaf and furnishes about the same amount of water. The actual survey work began on the 18th of May. The party was first in immediate charge of Truman A. Smith, junior engineer, beginning with the construction of the quarter boat and extending to June 18, one month. He was then succeeded by J. D. Ferguson, inspector, who was in charge from June 18 to July 20, when he was relieved by C. A. Turrell, surveyor, who conducted the party until the end of the survey at Moss Point, Miss., October 26, 1910. The party consisted of the surveyor in charge, as transitman, M. S. Long and L. C. Smith, levelmen, W. W. Toxey, principal recorder in charge of soundings and topography, 4 recorders acting as rodmen and surveymen; in addition a sufficient number of boatmen were employed to handle the five skiffs used and to move the quarter boat daily.

* * * * * * *

Leaf River after joining the Bowie pursues a very crooked course through Forest, Perry, and Greene Counties and touching the new county, George, at the edge of which it joins the Chickasahay River, a stream of almost equal size, with which it unites to form the Pascagoula River one-half mile above the town of Merrill, Miss.

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Pascagoula River flows across George and Jackson Counties, Miss., and empties into Mississippi Sound near Pascagoula, formerly Scranton, Miss. The width of Leaf River is from 150 to 200 feet, in characteristic reaches 170 feet. The width of Pascagoula River is from 200 to 350 feet, widening to 500 feet about 2 miles above Moss Point, where Dog River joins it. Leaf River is 78.86 miles long from Hattiesburg to its junction with the Chickasahay, and the Pascagoula is 82.10 miles long to Moss Point, making a total length of river surveyed of 160.96 miles.

The banks of both the Leaf and the Pascagoula are almost continuously bordered by woods, the exceptions being an occasional small area cleared for a log landing and a very few old fields. The cultivated fields near the river banks do not number more than a dozen in all. There are, however, a number of small towns or villages along the river, which have cleared landings for the convenience of sawmills, and at most of these towns there are bridges across the river.

Hattiesburg is a city of nearly 12,000 (census of 1910) and has railroad connections by the New Orleans, Mobile & Chicago Railroad and the New Orleans & Northeastern Railroad. The first-named railroad parallels the Leaf River from Hattiesburg down.

On Leaf River below Hattiesburg are the towns of McCallum, Belleville, Mahned, New Augusta, Wingate, and McLain. On the Pascagoula are Merrill, Benndale, and several smaller, the latter situated 2 or 3 miles from the river with ferry roads. The total distance by river is 161 miles; on a direct line by land, 77 miles, and by the shortest railroad route, 96 miles. The depth of the Leaf at ordinary low water varies from 12 to 15 feet in pools to from 1 to 3 feet at shoals. The material of the river bed is alluvial, consisting of mud, clay, and sand, the clay occurring often in banks, washed almost perpendicular by current, especially at certain sharp bends, where it lies in sufficient hardness to resist a rapid scour. The sand has been deposited in extensive bars lying generally immediately below sharp bends in the river, and are quite numerous, often changing position by action of spring floods, causing marked changes in the river bed and consequent depth of water from one season to another. The river banks are from 20 to 30 feet high on the Leaf and 15 to 18 on the Pascagoula; in a few cases the clay bluffs are from 50 to 75 feet high.

On the lower end of the Pascagoula for 15 miles the banks are less than 10 feet high. The river bottoms are from one-fourth to 2 miles wide, generally low and frequently consisting of swamp. In the dry season the bottoms are passable. There are frequent small chutes, called cut-offs, leaving the river and rejoining it some miles below or entering some tributary creek, making a network of small channels containing little water except at flood seasons. In order to prevent logs of valuable timber from lodging in these cut-offs a row of piling has usually been driven at their head to keep the logs from leaving the main river.

Most of the slope of these rivers is concentrated in the bars of sand and clay. The river bed is all so soft that no sudden falls are found, as frequently occurs in rivers of rocky bed. The total fall of water surface at low water is 125.03 feet, from Hattiesburg to Moss Point. Of this fall, 93.96 feet is in Leaf River, at a mean rate of 1.192 feet per mile and 31.07 feet in Pascagoula River, a mean fall of 0.378 foot per mile. The principal fall in the Pascagoula is above Dead Lake, near which the lunar tides begin to show. From the head of the Pascagoula, 50 miles to Dead Lake, the slope is 0.58 foot per mile, but from Dead Lake to the mouth of the river it is only 0.05 foot per mile, at mean low tide, the only time the slope is appreciable. At Dead Lake the daily tide is 1.25 feet. From Dead Lake, a distance of 32 miles above Moss Point, a depth of 10 feet is available at mean low water with a channel width of 100 feet, and from Brewton (1.6 miles below Dead Lake) down, the available depth is 12 feet. This depth if needed could be extended to Dead Lake at small cost. At Dead Lake two large streams enter the Pascagoula, Black Creek and Red River, and their confluence forms a basin 2 miles long from the Pascagoula. This is a prominent point at which many saw logs are collected and floated or towed down to Moss Point.

The following table shows in detail the different localities on the river in order, their distance from the initial point of survey, length of pools and shoals, fall in each shoal and total fall from point of beginning survey, characteristics of river bed at shoals and approximate amount of excavation required. These estimates of excavation are based on proposed channels 4 feet and 6 feet deep and 75 feet wide, from Hattiesburg to the mouth of the Leaf. The same depths with 100 feet width of channel is proposed from the mouth of the Leaf to Dead Lake. From Hattiesburg to the bridge at Mahned, the obstructions occur more frequently than from Mahned to the mouth of the Leaf. At one locality on the Leaf a cyclone crossed several years ago, filling the river at that point with timber blown from the bank.

The distances were measured by use of the stadia rod observed with a Berger transit. The sights along the river bank were part of a traverse line; sights averaged

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1,000 feet. The true bearings of the lines were checked by meridian observations on Polaris, each week or oftener, and azimuths corrected when necessary. A duplicate line of levels was run to determine slopes of the water surface. These were reduced to a low-water plane by an observed gauge carried with the party, compared with the permanent United States gauge readings at Merrill, Miss. The leveled slope terminates at mean tide level at Moss Point, which mean level at low tide is 125.03 feet below low-water surface at Hattiesburg.

Soundings were taken by stretching a graduated line across the river at each section and sounding at 20-foot intervals. Topography was taken with a hand level and rods, and the figures given on the contours, as shown in detail sketch, show the heights of each contour above mean low tide at Moss Point.

Estimate of yardage to be removed to give a 4-foot channel at mean low water, allowing 1 foot over depth, channel 75 feet wide.

Name of locality.	Distance from initial point of survey.	Length of pool.	Length of shoal.	Fall in each shoal.	Total fall from initial point to foot of shoal.	Character of river bed.	Excavation.
	Miles.	*Miles.*	*Miles.*	*Feet.*	*Feet.*		*Cu. yds.*
Hattiesburg, Bowie Creek Bridge.	0.00						
Pool below	.00	0.19					
Shoal No. 1	.19		0.04	0.01	0.06	Sand	2,404
Pool below	.23	.62					
Shoal No. 2	.85		.45	.33	.60	Sand	7,210
Pool below	1.30	.69					
Shoal No. 3	1.99		.54	.11	1.19	Sand	7,560
Pool below	2.53	.28					
Shoal No. 4	2.81		.24	.39	1.99	Sand	7,406
Pool below	3.05	.20					
Shoal No. 5	3.25		.04	.06	2.38	Sand	1,623
Pool below	3.29	.21					
Shoal No. 6	3.50		.28	.40	3.12	Sand	8,326
Pool below	3.78	.45					
Shoal No. 7	4.23		.08	.12	3.85	Sand	5,268
Pool below	4.31	.35					
Shoal No. 8	4.66		.09	.13	4.47	Sand	2,120
Pool below	4.75	.13					
Shoal No. 9	4.88		.34	.04	4.72	Sand	12,677
Pool below	5.22	.35					
Shoal No. 10	5.57		.11	.24	5.14	Sand	4,162
Pool below	5.68	.22					
Shoal No. 11	5.90		.12	.27	5.89	Sand	3,577
Pool below	6.02	.13					
Shoal No. 12	6.15		.38	.83	6.97	Sand	12,214
Pool below	6.53	.11					
Shoal No. 13	6.74		.34	.81	8.20	Sand	11,991
Pool below	7.08	.61					
Shoal No. 14	7.69		.15	.20	9.64	Sand	2,713
Pool below	7.84	.44					
Shoal No. 15	8.28		.41	.56	10.77	Sand	13,203
Pool below	8.69	.15					
Shoal No. 16	8.84		.21	.28	11.25	Sand	4,669
Pool below	9.05	.14					
Shoal No. 17	9.19		.68	1.68	13.15	Sand	18,883
Pool below	9.87	.23					
Shoal No. 18	10.10		.25	.70	14.21	Sand	3,875
Pool below	10.35	.05					
Shoal No. 19	10.40		.33	.46	14.75	Sand	2,778
Pool below	10.73	.06					
Shoal No. 20	10.79		.79	1.11	15.94	Sand	14,620
Pool below	11.58	.35					
Shoal No. 21	11.93		.22	.27	16.68	Clay-mud	6,494
Pool below	12.15	.57					
Shoal No. 22	12.72		.22	.27	17.66	Sand	9,724
Pool below	12.94	.25					
Shoal No. 23	13.19		.67	1.76	19.92	Sand	12,607
Pool below	13.86	.20					
Shoal No. 24	14.06		.09	.17	20.44	Sand	1,927
Pool below	14.15	.15					
Shoal No. 25	14.30		.10	.16	20.84	Sand	3,407
Pool below	14.40	.08					
Shoal No. 26	14.48		.22	.36	21.34	Sand-gravel	3,760
Pool below	14.70	.16					
Shoal No. 27	14.86		.24	.39	22.00	Sand-gravel	6,289
Pool below	15.10	.33					

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Estimate of yardage to be removed to give a 4-foot channel at mean low water, allowing 1 foot over depth, channel 75 feet wide—Continued.

Name of locality.	Distance from initial point of survey.	Length of pool.	Length of shoal.	Fall in each shoal.	Total fall from initial point to foot of shoal.	Character of river bed.	Excavation.
	Miles.	*Miles.*	*Miles.*	*Feet.*	*Feet.*		*Cu. yds.*
Shoal No. 28	15.43		0.13	0.21	22.76	Sand-gravel.	3,256
Pool below	15.56	0.16					
Shoal No. 29	15.72		.08	.13	23.14	Sand-gravel.	2,298
Pool below	15.80	.14					
Shoal No. 30	15.94		.06	.10	23.48	Sand	1,265
Pool below	16.00	.29					
Shoal No. 31	16.29		.16	.19	24.37	Sand	5,270
Pool below	16.45	.37					
McCullum Bridge	16.53						
Shoal No. 32	16.82		.21	.58	25.37	Clay and sand.	8,303
Pool below	17.03	.40					
Shoal No. 33	17.43		.18	.48	26.51	Sand	6,392
Pool below	17.61	.27					
Shoal No. 34	17.88		.28	.83	28.18	Sand	10,119
Pool below	18.16	.20					
Shoal No. 35	18.36		.13	.07	28.35	Sand	4,357
Pool below	18.49	.27					
Shoal No. 36	18.76		.58	.58	29.07	Sand	15,268
Pool below	19.34	.11					
Shoal No. 37	19.45		.10	.15	29.40	Sand	3,020
Pool below	19.55	.07					
Shoal No. 38	19.62		.64	.97	30.47	Sand	12,571
Pool below	20.26	.13					
Shoal No. 39	20.39		.24	.69	31.36	Sand	7,056
Pool below	20.63	.11					
Shoal No. 40	20.74		.33	1.14	33.16	Sand	11,131
Pool below	21.07	.07					
Shoal No. 41	21.14		.10	.04	33.23	Mud and sand.	5,148
Pool below	21.24	.06					
Shoal No. 42	21.30		.14	.06	33.32	Mud and sand.	2,005
Pool below	21.44	.27					
Shoal No. 43	21.71		.81	.67	34.10	Mud and Clay.	21,979
Pool below	22.52	.10					
Shoal No. 44	22.62		1.10	1.83	36.07	Mud	14,975
Pool below	23.72	.26					
Shoal No. 45	23.98		.25	.76	37.29	Mud and clay.	7,306
Pool below	24.23	.13					
Shoal No. 46	24.36		.29	.44	37.95	Mud and clay.	7,995
Pool below	24.65	.24					
Shoal No. 47	24.89		.56	.92	39.39	Sand and gravel.	8,278
Pool below	25.45	.07					
Shoal No. 48	25.52		.30	.27	39.73	Sand	5,702
Pool below	25.82	.09					
Shoal No. 49	25.91		.35	.32	40.14	Sand	7,144
Pool below	26.25	.12					
Shoal No. 50	26.37		.64	1.28	41.53	Mud	11,135
Pool below	27.01	.03					
Shoal No. 51	27.04		.04	.08	41.68	Mud	1,926
Pool below	27.08	.07					
Shoal No. 52	27.15		.49	.78	42.59	Sand	5,734
Pool below	27.64	.11					
Shoal No. 53	27.75		.07	.15	42.87	Sand	1,375
Pool below	27.82	.10					
Shoal No. 54	27.92		.34	.92	44.05	Sand	4,711
Mahned Bridge	28.20						
Pool below	28.26	.12					
Shoal No. 55	28.38		.10	.26	44.64	Sand	2,408
Pool below	28.48	.06					
Shoal No. 56	28.54		.10	.26	45.03	Sand	4,280
Pool below	28.64	.44					
Shoal No. 57	29.08		.71	1.99	47.80	Mud	24,630
Pool below	29.79	.21					
Shoal No. 58	30.00		.53	1.18	49.45	Mud	13,749
Pool below	30.53	.56					
Shoal No. 59	31.09		.25	.13	50.47	Mud and clay.	9,780
Pool below	31.34	.07					

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Estimate of yardage to be removed to give a 4-foot channel at mean low water, allowing 1 foot over depth, channel 75 feet wide—Continued.

Name of locality.	Distance from initial point of survey.	Length of pool.	Length of shoal.	Fall in each shoal.	Total fall from initial point to foot of shoal.	Character of river bed.	Excavation.
	Miles.	*Miles.*	*Miles.*	*Feet.*	*Feet.*		*Cu. yds.*
Shoal No. 60	31.41		0.57	0.30	50.80	Clay	14,414
Pool below	31.98	1.62					
New Augusta Bridge	33.33						
Shoal No. 61	33.60		.40	.52	52.49	Mud	9,582
Pool below	34.00	.02					
Shoal No. 62	34.02		.57	.88	53.40	Sand	7,354
Pool below	34.59	.07					
Shoal No. 63	34.66		.13	.17	53.66	Clay	5,888
Pool below	34.79	.69					
Shoal No. 64	35.48		.13	.07	54.45	Clay	4,954
Pool below	35.61	.30					
Shoal No. 65	35.91		.12	.09	54.71	Clay	4,877
Pool below	36.03	.24					
Shoal No. 66	36.27		.15	.19	55.24	Clay	5,479
Pool below	36.42	.14					
Shoal No. 67	36.56		1.38	1.34	56.65	Mud	23,506
Pool below	37.94	.03					
Shoal No. 68	37.97		.16	.51	57.20	Mud	6,676
Pool below	38.13	.73					
Shoal No. 69	38.86		.33	.62	58.87	Mud	8,558
Pool below	39.19	.13					
Shoal No. 70	39.32		.42	.63	59.71	Clay	5,430
Pool below	39.74	2.20					
Wingate Bridge	39.94						
Shoal No. 71	41.94		.18	.27	60.45	Sand	6,543
Pool below	42.12	.38					
Shoal No. 72	42.50		.14	.15	61.06	Mud	6,553
Pool below	42.64	.01					
Shoal No. 73	42.65		.44	.47	61.54	Sand	8,093
Pool below	43.09	.24					
Shoal No. 74	43.33		.88	1.21	63.14	Sand	9,449
Pool below	44.21	3.06					
Shoal No. 75	47.27		.20	.01	64.42	Sand	7,435
Pool below	47.47	.65					
Beaumont Railroad Bridge	47.72						
Beaumont Highway Bridge	47.75						
Shoal No. 76	48.12		.08	.01	64.45	Clay and sand.	3,584
Pool below	48.20	1.18					
Shoal No. 77	49.38		.20	.19	64.98	Clay and sand.	6,611
Pool below	49.58	.44					
Shoal No. 78	50.02		.47	.40	65.95	Sand	12,166
Pool below	50.49	1.15					
Shoal No. 79	51.64		.11	.10	67.22	Sand	1,702
Pool below	51.75	.65					
Shoal No. 80	52.40		.25	.21	68.74	Sand	6,669
Pool below	52.65	1.28					
Shoal No. 81	53.93		.09	.12	70.48	Sand	2,230
Pool below	54.02	.50					
Shoal No. 82	54.52		.21	.24	71.31	Mud	7,132
Pool below	54.73	.12					
Shoal No. 83	54.85		.32	.39	71.87	Sand	10,266
Pool below	55.17	.25					
Shoal No. 84	55.42		.24	.30	72.47	Sand	5,661
Pool below	55.66	.20					
Shoal No. 85	55.86		.10	.12	72.82	Sand	3,792
Pool below	55.96	.56					
Shoal No. 86	56.52		.37	.58	73.81	Sand	13,090
Pool below	56.89	.19					
Shoal No. 87	57.08		.20	.19	74.29	Mud	8,241
Pool below	57.28	.03					
Shoal No. 88	57.31		.23	.21	74.53	Sand	8,365
Pool below	57.54	1.90					
Shoal No. 89	59.44		.08	.03	75.94	Sand	2,495
Pool below	59.52	1.04					
McLain Highway Bridge	60.29						
Shoal No. 90	60.56		.46	.31	76.85	Sand	10,264
Pool below	61.02	1.49					
Shoal No. 91	62.51		.42	.05	77.32	Sand	13,112
Pool below	62.93	1.07					
Shoal No. 92	64.00		.07	.07	78.48	Sand	4,479
Pool below	64.07	.29					

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Estimate of yardage to be removed to give a 4-foot channel at mean low water, allowing 1 foot over depth, channel 75 feet wide—Continued.

Name of locality.	Distance from initial point of survey.	Length of pool.	Length of shoal.	Fall in each shoal.	Total fall from initial point to foot of shoal.	Character of river bed.	Excavation.
	Miles.	*Miles.*	*Miles.*	*Feet.*	*Feet.*		*Cu. yds.*
Shoal No. 93	64.36		0.32	0.21	78.89	Sand	8,304
Pool below	64.68	0.11					
Shoal No. 94	64.79		.31	.59	79.45	Sand	7,769
Pool below	65.10	.26					
Shoal No. 95	65.36		.08	.19	80.61	Sand and mud.	1,147
Pool below	65.44	.11					
Shoal No. 96	65.55		.27	.41	81.19	Sand	2,967
Pool below	65.82	.14					
Shoal No. 97	65.96		.07	.07	81.51	Sand	3,472
Pool below	66.03	.17					
Shoal No. 98	66.20		.15	.17	81.90	Sand	4,070
Pool below	66.35	.16					
Shoal No. 99	66.51		.24	.24	82.32	Sand	7,704
Pool below	66.75	.28					
Shoal No. 100	67.03		.29	.01	82.34	Sand	12,280
Pool below	67.32	.26					
Shoal No. 101	67.58		.10	.13	82.55	Sand	1,844
Pool below	67.68	.36					
Shoal No. 102	68.04		.02	.01	82.82	Sand	1,070
Pool below	68.06	.30					
Shoal No. 103	68.36		.14	.24	83.05	Sand	4,611
Pool below	68.50	.17					
Shoal No. 104	68.67		.09	.05	83.37	Sand	2,689
Pool below	68.76	.34					
Shoal No. 105	69.10		.08	.04	83.60	Sand	2,167
Pool below	69.18	.03					
Shoal No. 106	69.21		.20	.22	83.72	Sand	3,403
Pool below	69.41	.55					
Shoal No. 107	69.96		.05	.03	83.90	Sand	1,180
Pool below	70.01	.21					
Shoal No. 108	70.22		.12	.08	84.17	Sand	1,917
Pool below	70.34	.18					
Shoal No. 109	70.52		.20	.13	84.40	Sand	2,432
Pool below	70.72	.59					
Shoal No. 110	71.31		.36	.42	85.42	Sand	8,336
Pool below	71.67	.25					
Shoal No. 111	71.92		.68	.72	86.44	Sand	13,033
Pool below	72.60	.16					
Shoal No. 112	72.76		.04	.04	86.67	Sand	4,194
Pool below	72.80	.35					
Shoal No. 113	73.15		.20	.15	87.14	Sand	4,976
Pool below	73.35	.30					
Shoal No. 114	73.65		1.00	.97	88.62		24,841
Pool below	74.65	.20					
Shoal No. 115	74.85		.84	1.27	89.99	Sand	21,974
Pool below	75.69	.25					
Shoal No. 116	75.94		.17	.27	90.41	Sand	3,850
Pool below	76.11	.31					
Shoal No. 117	76.42		.17	.18	90.92	Sand	2,042
Pool below	76.59	.05					
Shoal No. 118	76.64		.39	.39	91.36	Sand	9,380
Pool below	77.03	.55					
Shoal No. 119	77.58		.22	.31	92.25	Sand	3,583
Pool below	77.80	.08					
Shoal No. 120	77.88		.98	1.62	93.96	Sand	19,071
Mouth	78.86						

Total yardage to be removed from Leaf River, 881,047 cubic yards. Fall per mile in Leaf River from Hattiesburg to mouth, 1.192 feet.

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Estimate of yardage to be removed from Pascagoula River to obtain a channel 100 feet wide and 4 feet deep, allowing 1 foot for overdepth.

Name of locality.	Distance from initial point of survey.	Length of pool.	Length of shoal.	Fall in each shoal.	Total fall from initial point to foot of shoal.	Character of river bed.	Excavation.
	Miles.	*Miles.*	*Miles.*	*Feet.*	*Feet.*		*Cu. yds.*
Pool below	78.86	0.35					
Shoal No. 121	79.21		0.20	0.06	94.17	Sand	3,901
Pool below	79.41	1.18					
Merrill Bridge	79.50						
Shoal No. 122	80.59		.04	.01	94.34	Sand	244
Pool below	80.63	.41					
Shoal No. 123	81.04		.17	.12	94.69	Sand	2,603
Pool below	81.21	.63					
Shoal No. 124	81.84		.06	.05	95.27	Sand	361
Pool below	81.90	.36					
Shoal No. 125	82.26		.12	.07	95.63	Sand	5,482
Pool below	82.38	3.49					
Shoal No. 126	85.87		.03	.03	97.48	Sand	2,451
Pool below	85.90	.84					
Shoal No. 127	86.74		.07	.02	97.91	Sand	2,081
Pool below	86.81	1.67					
Shoal No. 128	88.48		.14	.06	99.16	Sand	3,157
Pool below	88.62	.48					
Shoal No. 129	89.10		.14	.15	99.63	Sand	3,231
Pool below	89.24	.35					
Shoal No. 130	89.59		.18	.06	100.00	Sand	5,002
Pool below	89.77	.25					
Shoal No. 131	90.02		.12	.08	100.31	Sand	914
Pool below	90.14	.07					
Shoal No. 132	90.21		.24	.29	100.65	Sand	8,727
Pool below	90.45	.30					
Shoal No. 133	90.75		.18	.09	101.06	Sand	1,302
Pool below	90.93	.04					
Shoal No. 134	90.97		.44	.15	101.25	Sand	7,510
Pool below	91.41	.12					
Shoal No. 135	91.53		.39	.26	101.54	Sand	3,333
Pool below	91.92	.95					
Shoal No. 136	93.87		.27	.27	103.11	Sand	1,510
Pool below	94.14	.17					
Shoal No. 137	94.31		.04	.03	103.28	Sand	267
Pool below	94.35	.17					
Shoal No. 138	94.52		.03	.02	103.41	Sand	875
Pool below	94.55	.49					
Shoal No. 139	95.04		.05	.04	103.72	Sand	972
Pool below	95.09	.11					
Shoal No. 140	95.20		.23	.09	103.89	Sand	1,674
Pool below	95.43	.27					
Shoal No. 141	95.70		.20	.05	104.54	Sand	5,592
Pool below	95.90	.37					
Shoal No. 142	96.27		.04	.04	104.91	Sand	959
Pool below	96.31	.30					
Shoal No. 143	96.61		.25	.15	105.23	Sand	3,501
Pool below	96.86	.89					
Shoal No. 144	97.75		.08	.01	105.30	Sand	1,068
Pool below	97.83	.44					
Shoal No. 145	98.27		.13	.02	105.33	Sand	1,222
Pool below	98.40	.30					
Shoal No. 146	98.70		.14	.13	105.80	Sand	8,167
Pool below	98.84	1.36					
Shoal No. 147	100.20		.12	.12	107.00	Sand	2,148
Pool below	100.32	.15					
Shoal No. 148	100.47		.41	.53	107.67	Sand	14,739
Pool below	100.88	1.95					
Shoal No. 149	102.83		.47	.53	108.99	Sand	12,787
Pool below	103.30	.18					
Shoal No. 150	103.48		.21	.16	109.30	Sand	2,201
Pool below	103.69	.09					
Shoal No. 151	103.78		.05	.06	109.61	Sand	702
Pool below	103.83	1.79					
Shoal No. 152	105.62		.02	.01	110.02	Sand	343
Pool below	105.64	.56					
Shoal No. 153	106.20		.32	.32	110.57	Sand	2,939
Pool below	106.52	.21					
Shoal No. 154	106.73		.05	.04	111.00	Sand and mud.	1,161
Pool below	106.78	.79					
Shoal No. 155	107.57		.09	.04	111.41	Sand	3,059
Pool below	107.66	.88					

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Estimate of yardage to be removed from Pascagoula River to obtain a channel 100 feet wide and 4 feet deep, allowing 1 foot for overdepth—Continued.

Name of locality.	Distance from initial point of survey.	Length of pool.	Length of shoal.	Fall in each shoal.	Total fall from initial point to foot of shoal.	Character of river bed.	Excavation.
	Miles.	*Miles.*	*Miles.*	*Feet.*	*Feet.*		*Cu. yds.*
Shoal No. 156	108.54		0.17	0.20	112.21	Sand	2,955
Pool below	108.71	0.37					
Shoal No. 157	109.08		.14	.16	112.54	Sand	4,489
Pool below	109.22	.36					
Shoal No. 158	109.58		.27	.20	112.89	Sand	7,111
Pool below	109.85	.48					
Shoal No. 159	110.33		.02	.01	113.15	Sand	169
Pool below	110.35	.96					
Shoal No. 160	111.31		.09	.06	113.68	Sand	2,901
Pool below	111.40	.84					
Shoal No. 161	112.24		.14	.07	114.17	Sand and mud.	3,935
Pool below	112.38	.76					
Shoal No. 162	113.14		.13	.10	114.59	Sand	3,295
Pool below	113.27	1.01					
Shoal No. 163	114.28		.07	.01	115.04	Sand	386
Pool below	114.35	.46					
Shoal No. 164	114.81		.42	.60	115.71	Sand and mud.	9,227
Pool below	115.23	.23					
Shoal No. 165	115.46		.06	.05	115.97	Sand	355
Pool below	115.52	.71					
Shoal No. 166	116.23		.15	.04	116.36	Sand	3,722
Pool below	116.38	1.51					
Shoal No. 167	117.89		.26	.24	117.28	Sand	3,656
Pool below	118.15	.21					
Shoal No. 168	118.36		.02	.01	117.47	Sand	622
Pool below	118.38	.83					
Shoal No. 169	119.21		.26	.14	117.96	Sand	1,967
Pool below	119.47	.34					
Shoal No. 170	119.81		.11	.01	118.13	Sand	1,181
Pool below	119.92	.50					
Shoal No. 171	120.42		.21	.05	118.26	Sand	3,112
Pool below	120.63	.32					
Shoal No. 172	120.95		.23	.24	118.82	Sand	3,225
Pool below	121.18	.25					
Shoal No. 173	121.43		.21	.28	119.11	Sand	5,342
Pool below	121.64	.93					
Shoal No. 174	122.57		.27	.36	119.93	Sand	9,328
Pool below	122.84	.18					
Shoal No. 175	123.02		.05	.01	120.05	Sand	1,126
Pool below	123.07	.88					
Shoal No. 176	123.95		.43	.60	121.09	Sand	11,667
Pool below	124.38	.06					
Shoal No. 177	124.44		.04	.03	121.21	Sand	1,852
Pool below	124.48	.04					
Shoal No. 178	124.52		.06	.05	121.30	Sand	630
Pool below	124.58	.48					
Shoal No. 179	125.06		.29	.21	121.75	Sand and mud.	5,719
Pool below	125.35	2.20					
Shoal No. 180	127.55		.06	.03	122.70	Sand	1,409
Pool below	127.61	.73					
Shoal No. 181	128.34		.08	.02	123.03	Sand	806
Pool below	128.42	32.54					
Mouth of Dog River	160.96				125.03		

Total amount to be excavated from Pascagoula River, 206,953 cubic yards.
Total amount to be excavated from Leaf and Pascagoula Rivers, 1,088,000 cubic yards.

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Estimate of yardage to be removed to give a 6-foot channel at mean low water, allowing 1 foot overdepth, channel 75 feet wide.

Name of locality.	Distance from initial point of survey.	Length of pool.	Length of shoal.	Fall in each shoal.	Total fall from initial point to foot of shoal.	Character of river bed.	Excavation.
	Miles.	*Miles.*	*Miles.*	*Feet.*	*Feet.*		*Cu. yds.*
Bowie Creek Bridge	0.00						
Pool below	.00	0.14					
Shoal No. 1	.14		0.10	0.03	0.06	Sand	5,644
Pool below	.24	.55					
Shoal No. 2	.79		.53	.37	.62	Sand	15,733
Pool below	1.32	.19					
Shoal No. 3	1.51		.11	.07	.85	Sand	6,388
Pool below	1.62	.27					
Shoal No. 4	1.89		.72	.18	1.24	Sand	19,217
Pool below	2.61	.16					
Shoal No. 5	2.77		.41	.67	2.20	Sand	19,358
Pool below	3.18	.04					
Shoal No. 6	3.22		.14	.23	2.49	Sand	7,751
Pool below	3.36	.09					
Shoal No. 7	3.45		.37	.55	3.19	Sand	18,188
Pool below	3.82	.29					
Shoal No. 8	4.11		.39	.53	4.13	Sand	18,238
Pool below	4.50	.09					
Shoal No. 9	4.59		.19	.26	4.60	Sand	7,842
Pool below	4.78	.07					
Shoal No. 10	4.85		.55	.12	4.73	Sand	25,738
Pool below	5.40	.14					
Shoal No. 11	5.54		1.01	2.19	7.04	Sand	36,873
Pool below	6.55	.14					
Shoal No. 12	6.69		.84	1.46	8.79	Sand	37,157
Pool below	7.53	.13					
Shoal No. 13	7.66		1.44	1.93	11.32	Sand	60,207
Pool below	9.10	.06					
Shoal No. 14	9.16		.76	1.88	13.25	Sand	39,600
Pool below	9.92	.20					
Shoal No. 15	10.12		1.56	2.48	16.09	Sand	69,725
Pool below	11.68	.15					
Shoal No. 16	11.83		3.35	5.85	22.13	Clay and mud.	106,985
Pool below	15.18	.12					
Shoal No. 17	15.30		.84	1.62	23.93	Sand	25,540
Pool below	16.14	.04					
Shoal No. 18	16.18		.90	1.61	25.65	Sand	31,804
Pool below	17.08	.32					
Shoal No. 19	17.40		6.84	11.34	37.31	Sand	277,209
Pool below	24.24	.09					
Shoal No. 20	24.33		.35	.53	37.99	Clay and mud.	9,586
Pool below	24.68	.19					
Shoal No. 21	24.87		1.40	1.76	40.16	Clay	73,074
Pool below	26.27	.11					
Shoal No. 22	26.38		3.43	7.48	47.85	Mud	133,251
Pool below	29.81	.11					
Shoal No. 23	29.92		.81	1.71	49.81	Mud	29,861
Pool below	30.73	.09					
Shoal No. 24	30.82		1.23	.65	50.84	Mud and clay.	32,780
Pool below	32.05	.10					
Shoal No. 25	32.15		.24	.13	51.02	Mud	6,526
Pool below	32.39	.29					
Shoal No. 26	32.68		.22	.22	51.29	Mud	6,126
Pool below	32.90	.26					
Shoal No. 27	33.16		.27	.24	51.67	Mud	10,501
Pool below	33.43	.12					
Shoal No. 28	33.55		1.26	1.88	53.69	Mud	62,619
Pool below	34.81	.13					
Shoal No. 29	34.94		.70	.61	54.47	Clay	23,301
Pool below	35.64	.16					
Shoal No. 30	35.80		.68	.71	55.27	Mud	21,123
Pool below	36.48	.04					
Shoal No. 31	36.52		1.86	2.62	57.91	Mud	44,904
Pool below	38.38	.43					
Shoal No. 32	38.81		.90	1.46	59.67	Mud	31,171
Pool below	39.71	.14					
Shoal No. 33	39.85		.56	.12	60.06	Clay	16,970
Pool below	40.41	.27					
Shoal No. 34	40.68		.13		60.06	Sand	6,443
Pool below	40.81	.39					

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Estimate of yardage to be removed to give a 6-foot channel at mean low water, allowing 1 foot overdepth, channel 75 feet wide—Continued.

Name of locality.	Distance from initial point of survey.	Length of pool.	Length of shoal.	Fall in each shoal.	Total fall from initial point to foot of shoal.	Character of river bed.	Excavation.
	Miles.	*Miles.*	*Miles.*	*Feet.*	*Feet.*		*Cu. yds.*
Shoal No. 35	41.20		0.21		60.06	Sand	9,326
Pool below	41.41	0.15					
Shoal No. 36	41.56		.65	0.27	60.35	Sand	23,785
Pool below	42.21	.17					
Shoal No. 37	42.38		.81	1.06	61.67	Mud	33,879
Pool below	43.19	.04					
Shoal No. 38	43.23		.99	1.46	63.17	Sand	38,042
Pool below	44.22	.55					
Shoal No. 39	44.77		.15	.03	63.34	Sand	7,735
Pool below	44.92	.24					
Shoal No. 40	45.16		.24	.37	63.71	Sand	9,216
Pool below	45.40	1.85					
Shoal No. 41	47.25		.25	.02	64.42	Sand	12,468
Pool below	47.50	.56					
Shoal No. 42	48.06		.39	.02	64.46	Clay and sand.	17,539
Pool below	48.45	.94					
Shoal No. 43	49.34		1.87	1.84	66.59	Clay and sand.	60,107
Pool below	51.21	.24					
Shoal No. 44	51.45		.35	.33	67.27	Clay	9,926
Pool below	51.80	.09					
Shoal No. 45	51.89		.22	.61	68.06	Sand	6,170
Pool below	52.11	.27					
Shoal No. 46	52.38		.71	.62	69.22	Sand	18,858
Pool below	53.09	.68					
Shoal No. 47	53.77		1.42	1.74	71.88	Sand	53,172
Pool below	55.19	.04					
Shoal No. 48	55.23		.78	.94	72.73	Sand	28,934
Pool below	56.01	.06					
Shoal No. 49	56.07		.13	.11	73.04	Sand	4,721
Pool below	56.20	.28					
Shoal No. 50	56.48		.51	.76	73.97	Sand	27,391
Pool below	56.99	.04					
Shoal No 51	57.03		.85	1.26	75.21	Mud	33,024
Pool below	57.88	1.48					
Shoal No. 52	59.34		.27	.08	75.99	Sand	8,633
Pool below	59.61	.46					
Shoal No. 53	60.07		.04	.05	76.26	Sand	2,294
Pool below	60.11	.43					
Shoal No. 54	60.54		.52	.35	76.88	Sand	20,878
Pool below	61.06	1.42					
Shoal No. 55	62.48		.56	.09	77.36	Sand	27,703
Pool below	63.04	.59					
Shoal No. 56	63.63		.17	.26	78.19	Sand	7,694
Pool below	63.80	.10					
Shoal No. 57	63.90		.21	.22	78.52	Sand	5,879
Pool below	64.11	.18					
Shoal No. 58	64.29		.91	1.19	79.83	Sand	39,210
Pool below	65.20	.13					
Shoal No. 59	65.33		.52	.97	81.25	Sand and mud.	13,668
Pool below	65.85	.07					
Shoal No. 60	65.92		.15	.23	81.57	Sand	12,087
Pool below	66.07	.12					
Shoal No. 61	66.19		.18	.19	81.91	Sand	6,480
Pool below	66.37	.12					
Shoal No. 62	66.49		.34	.24	82.33	Sand	7,859
Pool below	66.83	.01					
Shoal No. 63	66.84		.50	.02	82.35	Sand	22,377
Pool below	67.34	.17					
Shoal No. 64	67.51		.36	.39	82.78	Mud	12,105
Pool below	67.87	.12					
Shoal No. 65	67.99		.09	.01	82.82	Sand	4,096
Pool below	68.08	.25					
Shoal No. 66	68.33		.58	.60	83.45	Sand	18,719
Pool below	68.91	.17					
Shoal No. 67	69.08		.37	.20	83.73	Sand	13,926
Pool below	69.45	.39					
Shoal No. 68	69.84		.91	.79	84.63	Sand	21,084
Pool below	70.75	.15					
Shoal No. 69	70.90		.13	.15	84.73	Sand	6,047
Pool below	71.03	.15					
Shoal No. 70	71.18		1.46	1.60	86.49	Sand	43,941
Pool below	72.64	.10					

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Estimate of yardage to be removed to give a 6-foot channel at mean low water, allowing 1 foot overdepth, channel 75 feet wide—Continued.

Name of locality.	Distance from initial point of survey.	Length of pool.	Length of shoal.	Fall in each shoal.	Total fall from initial point to foot of shoal.	Character of river bed.	Excavation.
	Miles.	*Miles.*	*Miles.*	*Feet.*	*Feet.*		*Cu. yds.*
Shoal No. 71	72.74		0.09	0.08	86.69	Sand	8,063
Pool below	72.83	0.22					
Shoal No. 72	73.05		.40	.32	87.21	Sand	13,813
Pool below	73.45	.17					
Shoal No. 73	73.62		2.54	2.87	90.44	Sand	111,300
Pool below	76.16	.16					
Shoal No. 74	76.32		.89	1.02	91.58	Sand	27,607
Pool below	77.21	.23					
Shoal No. 75	77.44		1.41	2.13	93.97	Sand	55,701
Mouth	78.85						

Total yardage to be removed from Leaf River, 2,249,912 cubic yards.

Estimate of yardage to be removed from Pascagoula River to obtain a channel 100 feet wide and 6 feet deep, allowing 1 foot for overdepth.

Name of locality.	Distance from initial point of survey.	Length of pool.	Length of shoal.	Fall in each shoal.	Total fall from initial point to foot of shoal.	Character of river bed.	Excavation.
	Miles.	*Miles.*	*Miles.*	*Feet.*	*Feet.*		*Cu. yds.*
Pool below	78.87	0.12					
Shoal No. 76	78.99		0.45	0.16	94.17	Sand	14,440
Pool below	79.44	1.11					
Shoal No. 77	80.55		.29	.13	94.45	Sand	3,686
Pool below	80.84	.12					
Shoal No. 78	80.96		.31	.22	94.74	Sand	10,008
Pool below	81.27	.26					
Shoal No. 79	81.53		.11	.10	95.06	Sand	1,288
Pool below	81.64	.14					
Shoal No. 80	81.78		.25	.36	95.53	Sand	3,027
Pool below	82.03	.19					
Shoal No. 81	82.22		.23	.13	95.66	Sand	14,324
Pool below	82.45	.93					
Shoal No. 82	83.38		.10	.00	95.74	Sand	2,963
Pool below	83.48	.53					
Shoal No. 83	84.01		.16	.17	95.93	Sand	1,344
Pool below	84.17	.12					
Shoal No. 84	84.29		.09	.06	96.08	Sand	520
Pool below	84.38	.40					
Shoal No. 85	84.78		.11	.13	96.53	Sand	630
Pool below	84.89	.02					
Shoal No. 86	84.91		.39	.43	96.98	Sand	4,156
Pool below	85.30	.13					
Shoal No. 87	85.43		.18	.17	97.15	Sand	4,144
Pool below	85.61	.12					
Shoal No. 88	85.73		.25	.29	97.56	Sand	1,947
Pool below	85.98	.02					
Shoal No. 89	86.00		.29	.12	97.69	Sand	3,611
Pool below	86.29	.38					
Shoal No. 90	86.67		.19	.08	97.92	Sand	5,333
Pool below	86.86	.15					
Shoal No. 91	87.01		.06	.05	98.04	Sand	600
Pool below	87.07	.45					
Shoal No. 92	87.52		.24	.20	98.63	Sand	1,941
Pool below	87.76	.52					
Shoal No. 93	88.28		1.14	.07	99.06	Sand	35,363
Pool below	89.42	.12					
Shoal No. 94	89.54		.95	.78	100.72	Sand	37,971
Pool below	90.49	.24					
Shoal No. 95	90.73		1.24	.63	101.61	Sand	40,765
Pool below	91.97	.35					
Shoal No. 96	92.32		.45	.10	101.96	Sand	7,421
Pool below	92.77	.27					

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Estimate of yardage to be removed from Pascagoula River to obtain a channel 100 feet wide and 6 feet deep, allowing 1 foot for overdepth—Continued.

Name of locality.	Distance from initial point of survey.	Length of pool.	Length of shoal.	Fall in each shoal.	Total fall from initial point to foot of shoal.	Character of river bed.	Excavation.
	Miles.	*Miles.*	*Miles.*	*Feet.*	*Feet.*		*Cu. yds.*
Shoal No. 97	93.04		0.50	0.19	102.37	Sand	9,919
Pool below	93.54	0.04					
Shoal No. 98	93.58		.62	.74	103.16	Sand	12,171
Pool below	94.20	.08					
Shoal No. 99	94.28		.14	.04	103.37	Sand	4,276
Pool below	94.42	.06					
Shoal No. 100	94.48		.29	.23	103.55	Sand	2,553
Pool below	94.77	.11					
Shoal No. 101	94.88		1.08	.88	104.50	Sand	20,468
Pool below	95.96	.12					
Shoal No. 102	96.08		.28	.26	104.94	Sand	5,969
Pool below	96.36	.06					
Shoal No. 103	96.42		.47	.24	105.24	Sand	14,032
Pool below	96.89	.06					
Shoal No. 104	96.95		.12	.01	105.27	Sand	1,120
Pool below	97.07	.55					
Shoal No. 105	97.62		.24	.01	105.30	Sand	5,872
Pool below	97.86	.38					
Shoal No. 106	98.24		.73	.59	105.91	Sand	20,106
Pool below	98.97	.43					
Shoal No. 107	99.40		.33	.15	106.40	Sand	2,824
Pool below	99.73	.40					
Shoal No. 108	100.13		.91	1.03	107.90	Sand	48,121
Pool below	101.04	.08					
Shoal No. 109	101.12		.25	.12	108.09	Sand	4,669
Pool below	101.37	.35					
Shoal No. 110	101.72		.25	.07	108.20	Sand	4,309
Pool below	101.97	.82					
Shoal No. 111	102.79		.53	.54	109.00	Sand	35,180
Pool below	103.32	.10					
Shoal No. 112	103.42		.30	.25	109.34	Sand	10,502
Pool below	103.72	.01					
Shoal No. 113	103.73		.13	.17	109.52	Sand	3,111
Pool below	103.86	.09					
Shoal No. 114	103.95		.36	.09	109.69	Sand	3,759
Pool below	104.31	.82					
Shoal No. 115	105.13		.10	.02	109.82	Sand	2,074
Pool below	105.23	.30					
Shoal No. 116	105.53		.20	.09	110.05	Sand	5,343
Pool below	105.73	.29					
Shoal No. 117	106.02		.85	.62	111.01	Sand	24,440
Pool below	106.87	.50					
Shoal No. 118	107.37		.43	.19	111.47	Sand	10,341
Pool below	107.80	.40					
Shoal No. 119	108.20		.55	.59	112.25	Sand	20,252
Pool below	108.75	.27					
Shoal No. 120	109.02		.42	.33	112.64	Sand	13,342
Pool below	109.44	.42					
Shoal No. 121	109.86		.16	.12	113.03	Sand	17,991
Pool below	110.02	.09					
Shoal No. 122	110.11		.08	.08	113.11	Sand	1,362
Pool below	110.19	.10					
Shoal No. 123	110.29		.18	.07	113.20	Sand	3,454
Pool below	110.47	.68					
Shoal No. 124	111.15		.27	.16	113.69	Sand	9,704
Pool below	111.42	.94					
Shoal No. 125	112.36		.07	.04	114.19	Sand and mud.	11,574
Pool below	112.43	.29					
Shoal No. 126	112.72		.12	.05	114.36	Sand	1,533
Pool below	112.84	.24					
Shoal No. 127	113.08		.22	.15	114.61	Sand	8,047
Pool below	113.30	.62					
Shoal No. 128	113.92		.48	.25	115.04	Sand	10,601
Pool below	114.40	.23					
Shoal No. 129	114.63		.62	.62	115.72	Sand and mud.	26,475
Pool below	115.25	.19					
Shoal No. 130	115.44		.09	.09	115.98	Sand and mud.	2,065
Pool below	115.53	.38					
Shoal No. 131	115.91		.08	.06	116.21	Sand and mud.	1,941
Pool below	115.99	.05					

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Estimate of yardage to be removed from Pascagoula River to obtain a channel 100 feet wide and 6 feet deep, allowing 1 foot for overdepth—Continued.

Name of locality.	Distance from initial point of survey.	Length of pool.	Length of shoal.	Fall in each shoal.	Total fall from initial point to foot of shoal.	Character of river bed.	Excavation.
	Miles.	*Miles.*	*Miles.*	*Feet.*	*Feet.*		*Cu. yds.*
Shoal No. 132	116.04		0.57	0.45	116.70	Sand	20,732
Pool below	116.61	1.21					
Shoal No. 133	117.82		.36	.32	117.32	Sand	13,857
Pool below	118.18	.14					
Shoal No. 134	118.32		.36	.12	117.58	Sand	5,200
Pool below	118.68	.34					
Shoal No. 135	119.02		.47	.32	117.97	Sand	9,479
Pool below	119.49	.18					
Shoal No. 136	119.67		.26	.04	118.13	Sand	6,958
Pool below	119.93	.28					
Shoal No. 137	120.21		.49	.12	118.28	Sand	14,751
Pool below	120.70	.22					
Shoal No. 138	120.92		.28	.06	118.56	Sand	10,696
Pool below	121.20	.24					
Shoal No. 139	121.44		.28	.28	119.26	Sand	16,350
Pool below	121.72	.16					
Shoal No. 140	121.88		.12	.03	119.37	Sand	1,135
Pool below	122.00	.53					
Shoal No. 141	122.53		.90	.61	120.15	Sand	31,765
Pool below	123.43	.32					
Shoal No. 142	123.75		.89	1.07	121.32	Sand	43,361
Pool below	124.64	.24					
Shoal No. 143	124.88		.48	.35	121.76	Sand and mud.	17,571
Pool below	125.36	.46					
Shoal No. 144	125.82		.30	.16	122.26	Sand	3,400
Pool below	126.12	.78					
Shoal No. 145	126.90		.79	.34	122.90	Sand	17,967
Pool below	127.69	.13					
Shoal No. 146	127.82		.16	.10	122.93	Sand	1,166
Pool below	127.98	.12					
Shoal No. 147	128.10		.50	.08	123.04	Sand	1,852
Pool below	128.60	.07					
Shoal No. 148	128.67		.10	.06	123.10	Sand	272
Pool below	128.77	.21					
Shoal No. 149	128.98		.06	.12	123.30	Sand	845
Pool below	129.04	31.92					
Mouth	160.96						

Total to be excavated from Pascagoula River 810,088 cubic yards.
Total to be excavated from Leaf and Pascagoula Rivers 3,060,000 cubic yards.

IMPROVEMENT.

For obtaining and maintaining a channel from Dead Lake to mouth of river, 100 feet wide and 10 feet deep at mean low tide, only cost of removing snags.

This lower section of the Pascagoula, has lately been snagged.

The floods usually occur in these rivers in the spring and early summer, and the lowest water in the fall. At Merrill where the United States has kept gauge observations for about seven years on the Pascagoula, the flood of 1900 reached 28 and that of 1909, 25 feet 6 inches at same point. Merrill is at the New Orleans, Mobile & Chicago Railroad crossing of the Pascagoula. The lowest observation recorded gave 0.2 on the gauge which is 0.8 below ordinary low water. This extreme low water occurs about once in six years and only for a few weeks at a time. In the lower portion of the Pascagoula the floods attain a much less height, but no reliable high-water marks were found. Discharge measurements were taken at Hattiesburg and one-half mile above the mouth of the Leaf. Also of the Chickasahay River near its mouth and of the Pascagoula, at Merrill, and 2 miles above Dead Lake where tidal influence first appeared. The following are the results of these measurements which were taken on different dates and at different stages of water.

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LEAF RIVER.

Locality.	Date.	Gauge.	Discharge.
			Sec.-ft.
Hattiesburg, Miss.	July 12, 1910	+ 2.1	2,032
Do	Oct. 27, 1910	0.0	576
Leaf ¼ mile above mouth	Oct. 29, 1910	[1]+ 0.2	828
Do	Aug. 29, 1910	[1]+ 2.3	1,788
Do	July 14, 1910	[1]+ 9.0	5,229

CHICKASAHAY RIVER.

One-half mile above mouth	Oct. 29, 1910	+ 0.2	508
Do	Aug. 29, 1910	+ 2.3	1,115
Do	July 14, 1910	+10.5	5,645

PASCAGOULA RIVER.

At Merrill	Aug. 14, 1910	[1]+ 2.3	3,209
Do	Oct. 30, 1910	[1]+ 0.2	1,315
Do	July 13, 1910	+11.0	16,634
2 miles above Dead Lake	Sept. 24, 1910	+ 0.5	1,716

[1] Gauge at Merrill. On the Merrill gauge 0.2 equals extreme low water.

There are at present no boats on Leaf River at any season of the year. They can not run at low water and the county bridges prevent them from running at higher stages. On the Pascagoula, a small boat has ascended to Merrill 81.3 miles at irregular intervals, but there is no regular trade and none except small launches have been there this year (1910). Tugs ascend to Dead Lake to bring out rafts of logs and crossties or telephone poles. Two years ago a small steamer named the *Owl* made trips to Benndale in the employ of the Farnsworth Lumber Co., carrying commissary stores. This mode of transportation has been discontinued and the stores are now hauled from the railroad 12 miles distant. A small boat has in the past been as far as Hattiesburg, on the Leaf, before the present bridges were built. The county trustees of Forest and Greene Counties were seen and expressed willingness to alter these bridges if shown to them that the river could be made navigable.

No doubt many of the sand bars now existing in the rivers, especially in the Leaf, have been wholly or partially formed by the logs lodging at certain points. Snagging the river thoroughly would therefore constitute a large part of the work of improvement. This work of snagging is now being done. There are two snagboats, one working from Hattiesburg down, the other from Dead Lake up. They can only work during the low water season about eight months of each year. At their present rate of progress, which is the best practicable, several years will be required to make one trip over the two rivers. About three-fourths of the obstructions are saw logs which have been turned adrift, the present custom being to drive or float logs instead of rafting them.

Were all snags removed many of these bars would doubtless scour out. If the custom of floating the logs loose should be abandoned and rafting adopted and required there would be fewer obstructions. At present the rivers appear to be given up to the men owning the timber interests. If the river should be improved commerce would probably be much increased. The mill men at Moss Point have combined and built a log boom of timbers chained to piling which are driven 20 feet apart. This boom is 4 miles long near the mouth of the Pascagoula, being located near the center of the river. There is also a short boom across the West Fork of the Pascagoula, for the principal purpose of confining floating timber to the East Fork.

The citizens of Hattiesburg would take the lead in using the river and put a boat in if practicable. Interest at other points is less. There are railroad bridges at Hattiesburg, New Augusta, and Merrill. The last named bridge is provided with a draw which has lately been put in good condition. There are county highway bridges at Hattiesburg (two), Belleville, Mahned, New Augusta, Wingate, and McLain.

The timber business has declined somewhat the last two years on account of low prices, more than on account of a scarcity of timber. The Farnsworth Lumber Co., who operate two log railroads reaching the river at Benndale, say they have timber enough to keep them 12 years getting it to the river.

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I do not think any land would be reclaimed in improving the river unless the flood lines should be considerably altered, but owners of lands would be encouraged to drain them if assured of permanent navigation. Much of the land has been "cut over" and might be used for farming or stock raising.

The expenses of the survey were as follows:

Establishing preliminary benches		$119.76
Building quarter boat	$935.54	
Survey proper:		
Pay rolls	4,297.65	
Subsistence	1,096.65	
Miscellaneous	90.37	
Total survey		6,420.21
Office work on quarter boat to Dec. 31, 1910:		
Pay rolls	642.01	
Subsistence	86.06	
Miscellaneous	52.86	
Total office work		780.93
Total cost to Dec. 31, 1910		7,320.90

Very respectfully,

Maj. C. A. F. FLAGLER,
Corps of Engineers.

C. A. TURRELL, *Surveyor.*

SUPPLEMENTAL REPORT.

UNITED STATES ENGINEER OFFICE,
Mobile, Ala., February 1, 1915.

SIR: 1. Since the reference of these papers to this office, repeated attempts have been made to secure from the persons interested in the improvement statements of changes in local business conditions which might bear upon the advisability of the improvement. Failing to secure reply to letters on the subject, after due notice to those concerned, I recently visited Hattiesburg, Miss., and had an interview with the secretary of the commercial club and with other prominent citizens, none of whom were able to supply any additional information of sufficient importance for record here. In this connection attention is invited to the accompanying letter[1] from the secretary of the commercial club. In a general way I also had the opportunity to investigate the industries of the city of Hattiesburg, and thereafter I made a personal inspection of the river between Hattiesburg and Merrill, Miss., a distance of approximately 79 miles.

2. At the time of my inspection the river was at a medium stage, not so high, however, as to prevent me from forming a satisfactory idea of its general character. It is plainly a river with movable bed, and the 181 bars mentioned in the report on the survey are composed of relatively light material, the supply of which is large, practically inexhaustible. Any attempt to improve the stream by dredging away the obstructing shoals would be a failure unless provision were made for removing the same shoals or others near by at frequent intervals, and in any event dredging bars would lower pools above them and thus prove of little avail. Of the 1,000,000 yards of dredging shown to be required for the 4-foot channel, a large part would without doubt be required to be removed annually.

[1] Not printed.

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3. The slope of the upper portion of the river is too great to give any just basis for the expectation that it can be improved by the kind of regulation described in the report, and if regulation and dredging of more thorough character are resorted to, the cost of the original improvement will certainly not be less than $5,000 a mile, and may perhaps be more. On the Mississippi River above Lake Pepin where the low-water discharge is approximately three times that ascribed to Leaf River, but where the slope is much gentler, the cost of improvement under the original project for a 4-foot channel, approximated $15,000 per mile, and here stone, the more costly of the material used, was very cheap. On Leaf River the cost of stone would be prohibitive, and yet contraction works of reasonable stability can not be built without its use.

4. Between Hattiesburg and Merrill there is not a single town of any kind on the river banks, and Merrill is a very small village. At the three or four localities where houses were to be seen from the river, these were isolated structures. Nowhere was there any evidence of human habitation to an extent worthy of consideration. Where the banks of the river were sufficiently high to permit the cultivation of the soil, the cultivated lands lay a mile or thereabouts from the river bank.

5. All circumstances considered, it is believed that while the country in the vicinity of Leaf and Pascagoula Rivers will eventually be well settled by a prosperous and productive community, at present the conditions are not such as to promise the profitable use of the improvements now asked for by the locality, the only industry at all likely to use the improved stream being rafting, which apparently even now does not use to the fullest extent the facilities available.

6. Pascagoula River below Merrill, which was recently inspected by Assistant Engineer Reed, has low banks, and there is little likelihood that much traffic will originate on it except logs and lumber in rafts. Such traffic as will use the two streams, which practically constitute a continuous whole, will either originate in or be destined for Merrill and points above it.

7. While my recommendation has not been asked, it seems permissible to suggest that the prosecution of the existing project below Merrill only upon a more liberal scale, at any rate for a limited period of years, might considerably improve navigation so as to furnish sufficient facilities until the time when the building up of the tributary territory might justify renewed consideration of the question of further improvement below Merrill and resumption of operations between Merrill and Hattiesburg. Up to June 30, 1914, the total spent upon the entire length of the river under consideration amounted to about $97,000—an average of something less than $4,000 a year. This is certainly too little to produce useful results. To operate a non-propelled steam snagboat with attendant small launch, will cost about $15,000 per year. I regard the local situation as sufficiently promising to justify this expenditure below Merrill for a limited period, and accordingly recommend that the action upon this survey report be such as to cause this amount to be made available annually. When rafting no longer exists to cause accumulations of snags and obstructions to navigation in the Leaf River between Hattiesburg and Merrill in such quantities as to make it almost impossible to dispose of the recurrent supply, it is probable that commercial conditions

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will have become such as to justify the expense of improving its channel so as to afford a depth of from 3 to 4 feet at low water.

C. KELLER,
Lieut. Col., Corps of Engineers.

The CHIEF OF ENGINEERS, UNITED STATES ARMY
(Through the Division Engineer).

[Third indorsement.]

OFFICE OF DIVISION ENGINEER, GULF DIVISION,
Baltimore, Md., February 8, 1915.

To the CHIEF OF ENGINEERS.

1. Forwarded.

2. It is not believed that there is any real demand for the improvement of the upper portions of Leaf and Pascagoula Rivers, except from the town of Hattiesburg, which desires the work for the purpose of becoming a town possessing water competition with the railroads and thus securing reduced railroad rates.

3. The banks of both the Leaf and the Pascagoula are almost continuously bordered by woods, with the exception of an occasional small area cleared for a log landing, and a very few old fields. The cultivated fields near the river banks do not number more than a dozen in all. The small towns or villages which do occur along the river and have cleared landings appear to be adjuncts of sawmills.

4. The distance by water is 160 per cent of that by railroad, and more than 200 per cent of direct line distance. The river bottoms are from ¼ to 2 miles wide, generally low and frequently consisting of swamp, and are generally passable only in the dry season. Through these bottom lands are frequent small chutes leaving the river and rejoining it some miles below, forming a network of small channels containing water at high stages, but forming obstructions to development of land at all times. These conditions do not appear to have changed in any respect since the first report was submitted.

5. There seems to be no demand for the improvement except from Hattiesburg for the purpose stated above. Under these circumstances the division engineer is of the opinion that the only navigation of the stream is the floating of logs, and believes that no greater or more expensive improvement should be undertaken by the Government than that necessary to facilitate this class of commerce.

LANSING H. BEACH,
Colonel, Corps of Engineers,
Division Engineer.

[Fifth indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
February 16, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. The views of the board were fully expressed in its report dated November 4, 1912, and there is nothing in the supplemental report of the district officer to change them. The papers are therefore returned without modification.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 417.

CONNECTICUT RIVER, BETWEEN HARTFORD, CONN., AND HOLYOKE, MASS.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORTS ON PRELIMINARY EXAMINATION AND SURVEY OF CONNECTICUT RIVER, BETWEEN HARTFORD, CONN., AND HOLYOKE, MASS.

DECEMBER 16, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustrations.

WAR DEPARTMENT,
Washington, December 15, 1915.

THE SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit, herewith, a letter from the Chief of Engineers, United States Army, dated 12th ultimo, together with copies of reports from Maj. G. B. Pillsbury, Corps of Engineers, dated May 28, 1913, and April 15, 1915, with maps, on preliminary examination and survey, respectively, of Connecticut River, between Hartford and Holyoke, made by him in compliance with the provisions of the river and harbor act approved March 4, 1913.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

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WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, November 12, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Connecticut River, between Hartford and Holyoke.

1. There are submitted herewith for transmission to Congress reports dated May 28, 1913, and April 15, 1915, with maps, by Maj. G. B. Pillsbury, Corps of Engineers, on preliminary examination and survey, respectively, authorized by the river and harbor act approved March 4, 1913, of Connecticut River from Hartford, Conn., to Holyoke, Mass.

2. The Connecticut River is under improvement from its mouth to Hartford, a distance of 52 miles, with a view to securing a channel 12 feet deep at mean low water and 100 feet wide. The project has not been completed, but a channel of sufficient depth to accommodate vessels having a draft of 10 feet has been provided and is being maintained. The stretch from Hartford to Holyoke is 34 miles long, and is naturally divided into three distinct sections. From Hartford to the foot of Enfield Rapids, 10½ miles, the river has a sandy, shifting bottom; from the foot to the head of Enfield Rapids, 5½ miles, the total fall of low water is 35 feet, and the bed of the river is largely rock; from Enfield Rapids to Holyoke, 18 miles, the river is of moderate width, gentle slope, fair depth, and stable bottom. From 1871 to 1886 a small amount of wing-dam work was done by the United States between Hartford and Enfield Rapids, and appropriations have been since made for maintenance of this work. Permanent benefit, however, can be secured only from a more radical and expensive form of improvement. Several examinations and surveys with this object in view have been made. The most recent of these prior investigations was made in 1909 and 1910, and the report is printed in House Document No. 818, Sixty-first Congress, second session.

3. To render the improvement of this section of the river commercially successful, having in mind the needed capacity of vessels and their suitability for navigation in Long Island Sound, the district officer believes that a depth of 12 feet at mean low water and width of 100 feet should be given. He submits a plan providing for a channel of these dimensions to be secured by the construction of locks and dams at Hartford and at Enfield Rapids and by channel excavation and regulating works of limited extent, at a total first cost to the United States of $1,870,000 and $65,000 annually for maintenance and operation, this estimate being on the basis of the Enfield Lock and Dam being constructed by private interests. If this lock and dam is not constructed by private interests within a reasonable time, he believes the United States should undertake the entire work and lease the power created. On this basis the cost to the United States will be increased to $3,950,000. He recommends, however, that the appropriations be made subject to the provision that no work be done by the United States until the Secretary of War is satisfied that adequate terminal facilities under municipal or other public control will be provided at the cities of Springfield, Holyoke, and Chicopee by the time the project is completed. The division

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engineer concurs, in the main, with the district officer, but believes that work should not be undertaken by the United States, unless the lock and dam at Enfield Rapids are constructed by private, municipal, or State funds, and the use of all water needed for navigation purposes be deeded to the United States by the parties operating the dam for power purposes.

4. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated September 14, 1915, concurring in general with the views of the district officer and the division engineer.

5. After due consideration of the above-mentioned report, I concur in general with the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of the Connecticut River between Hartford, Conn., and Holyoke, Mass., is deemed advisable to the extent of providing a channel 12 feet deep at mean low water and 100 feet wide, under the plans proposed by the district officer (subject to such modifications as may appear advisable during construction), at an estimated cost of $1,870,000 for first construction and $65,000 annually thereafter for maintenance, subject to the following conditions:

(*a*) That water power or other interests will construct a new lock and dam at Enfield in accordance with the plans proposed by the district officer or such other modified plans as may be approved by the Chief of Engineers and the Secretary of War, under the general provision of law applicable to such cases;

(*b*) That the lock and such adjacent land as may be needed for its operation and care shall be deeded without cost to the United States, and sufficient power shall be supplied free of cost for its operation, but that otherwise the lock shall be maintained and operated at the expense of the Federal Government;

(*c*) That those constructing the lock and dam shall assume all responsibility for claims for damages that may arise from flowage rights, from injury to water power, or from any other source; and

(*d*) That the cities of Springfield, Holyoke, and Chicopee shall make suitable provision for terminal facilities satisfactory to the Secretary of War.

The first appropriation should be $520,000, with authority to enter into contracts to an additional sum of $300,000. Subsequent appropriations should be at the rate of $350,000 per year for three years.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS ON SURVEY.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 14, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's reports on preliminary examination and survey of Connecticut River from

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Hartford, Conn., to Holyoke, Mass., called for by the act of March 4, 1913:

2. The Connecticut River is under improvement from its mouth to Hartford, a distance of 52 miles, the project providing for a channel 12 feet deep at mean low water and 100 feet wide. The project has not been completed, but a channel has been provided and is being maintained of sufficient depth to accommodate vessels having a draft of 10 feet.

3. The city of Holyoke is situated about 33 miles above Hartford. The river between these cities is divided into three sections of different characteristics—(1) Hartford to Enfield Rapids, about 11 miles, having a navigable depth of 2 to 3 feet at mean low water. (2) Enfield Falls reach, 5.2 miles, total fall about 35 feet, surmounted by a privately constructed canal with locks about 18 by 80 feet, with 3.7 feet depth at mean low water on the lower sill of lower lock. The canal was nominally constructed for navigation purposes but is used mainly for supplying water power to manufacturing establishments at the town of Windsor Locks. The canal is owned by the Connecticut River Co., chartered by the State of Connecticut in 1828. (3) The pool formed by the Enfield Dam, extending to Holyoke 16.5 miles, with navigable depth at mean low water of about 6 feet. Several towns of importance are located on this reach. A power dam at Holyoke prevents further navigation up the river, the locks and navigation canal at this place having fallen into ruin.

4. Until about 1882 there was a light-draft steamboat service up to Springfield, but for many years navigation has been confined to excursion and motor boats in the Enfield Dam pool. During the period 1871–1886 a small amount of wing-dam work was done by the United States between Hartford and the Enfield Rapids but without lasting results.

5. Numerous plans for the improvement of the reach under consideration have been presented in reports referred to by the district officer. The last one, submitted in 1910, published in House Document No. 818, Sixty-first Congress, second session, recommends the improvement of the river by the United States under a project providing for a channel 7 feet deep and 100 feet wide at an estimated cost of $1,015,600, with the condition that a suitable lock and dam for surmounting Enfield Rapids shall be built by private or corporate interests, free of cost to the United States; that navigation shall be free from tools; that those constructing the lock and dam shall assume all responsibility for damages; and that after construction the lock and dam shall become the property of and be maintained by the United States. No action by Congress has been taken on this report.

6. The population of the territory directly affected by the proposed improvement is reported as exceeding 200,000. The total freight tonnage is given as 2,977,900, the principal commodity being coal. What part of this commerce would be carried by water if adequate facilities were provided is speculative, but the district officer believes it would amount to as much as 700,000 tons annually and would effect a saving of from $200,000 to $300,000 a year, with a prospect of this amount being increased if the communities adjacent continue to grow.

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7. The district officer discusses the question of the proper depth to be provided to meet the probable demands of commerce and, for reasons given, concludes that it should be 12 feet and the width generally 100 feet, so as to accommodate the vessels to be used on the enlarged Erie Canal and to permit such vessels as now go to Hartford to proceed to points on the river above without breaking bulk.

8. Plans with estimates are presented for improving the reach between Hartford and the Enfield Rapids both by open-channel improvement and by canalization by means of one lock and dam located 1½ miles above the Hartford Bridge, the respective estimates being $2,080,000 and $1,405,000, with $45,000 and $40,000 per annum for maintenance. Due to the lower cost of construction and maintenance and on account of other advantages, the district officer is of opinion that the canalization plan is the better.

9. In the upper reach the pool formed by the Enfield Dam gives generally a depth greater than proposed, and the only work required is some dredging and rock excavation, estimated to cost $465,000, and $15,000 annually for maintenance.

10. To complete the improvement and make it of value to navigation, as well as to water-power interests, will require a new lock and dam at the Enfield Rapids. It appears that private interests are ready to provide these structures without cost to the United States for the use of the power developed, if the necessary authority is given. Plans are presented for a dam and a lock having a chamber 310 by 45 feet in horizontal dimensions, estimated to cost $2,080,000, and $10,000 per annum for maintenance and operation. The cost of improvement to the United States will therefore be $1,870,000, if private interests construct the new lock and dam at the rapids, and $3,950,000 if the United States constructs the lock and dam in addition to the work required above and below. Maintenance and operation would amount to $65,000 a year.

11. The amount of water power that may be expected from the development in excess of that now used by the mills is computed by the district officer, on the basis of a 30,000-horsepower plant, at about 13,333 horsepower, which he states would have a leasing value estimated at $100,000, or $7.50 per horsepower per annum.

12. The district officer discussess the question of terminals and cooperation, and he believes that local interests and the State should cooperate by constructing suitable and adequate terminals at several points, which he estimates will represent a considerable sum when compared with the cost of the project.

13. In conclusion, the district officer expresses the opinion that the Connecticut River between Hartford and Holyoke is worthy of improvement by the United States, under a project providing for a channel 12 feet deep at mean low water and generally 100 feet wide, to be obtained by the construction of a lock and dam at Hartford and by channel excavation and regulating works of limited extent, at a total first cost of $1,870,000 and $65,000 annually for maintenance and operation, this estimate being on the basis of the Enfield Lock and Dam being constructed by private interests. If such lock and dam are not constructed by private interests within a reasonable time,

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he believes the United States should undertake the entire work and lease the power created. On this basis the cost will be increased $2,080,000. He recommends, however, that the appropriations be made subject to the provision that no work be done by the United States until the Secretary of War is satisfied that adequate terminal facilities under municipal or other public control will be provided at the cities of Springfield, Holyoke, and Chicopee by the time the project is completed.

14. The division engineer concurs in the main with the district officer, but believes that work should not be undertaken by the United States, unless the lock and dam at Enfield Rapids is constructed by private, municipal, or State funds, and the use of all water needed for navigation purposes be deeded to the United States by the parties operating the dam for power purposes.

15. As stated by the district officer, favorable recommendation has been made for the improvement of this waterway at a cost to the United States of $1,015,600, provided, among other things, that private or cooperate interests construct a suitable lock and dam free of cost to the United States. The depth adopted at that time was 7 feet. In view of the prospective opening of the enlarged Erie Canal in the near future, the increasing size of vessels used in the Sound and tributary waters, and the continual growth of population and business adjacent, it appears that the proper depth of channel would now be 12 feet, which will necessitate a corresponding increase in cost. The present estimate is $1,870,000, aside from the Enfield Lock and Dam, which the board believes, in concurrence with the division engineer, should be constructed by water-power interests.

16. This increase in cost over the former estimates seems fully justified, and therefore the board recommends the adoption of a project for the improvement of the Connecticut River from Hartford to Holyoke, Mass., following generally the plans proposed by the district officer, at a cost to the United States of $1,870,000 for first construction and $65,000 annually thereafter for maintenance, provided (*a*) that water-power or other interests will construct a new lock and dam at Enfield in accordance with the plans proposed by the district officer, or such other modified plans as may be approved by the Chief of Engineers and the Secretary of War, under the general provision of law applicable to such cases; (*b*) that the lock and such adjacent land as may be needed for its operation and care shall be deeded without cost to the United States, and sufficient power shall be supplied free of cost for its operation, but that otherwise the lock shall be maintained and operated at the expense of the Federal Government; (*c*) that those constructing the lock and dam shall assume all responsibility for claims for damages that may arise from flowage rights, from injury to water power, or from any other source; (*d*) that the cities of Springfield, Holyoke, and Chicopee shall make suitable provision for terminal facilities satisfactory to the Secretary of War.

17. In compliance with law, the board reports that, except as contemplated by the above recommendations, there are no questions of terminal facilities, water power, or other subjects so related to the project proposed that they may be coordinated therewith to lessen

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the cost and compensate the Government for expenditures made in the interests of navigation.

For the board:

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

PRELIMINARY EXAMINATION OF CONNECTICUT RIVER, BETWEEN HARTFORD, CONN., AND HOLYOKE, MASS.

UNITED STATES ENGINEER OFFICE,
New London, Conn., May 28, 1913.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Report of preliminary examination, Connecticut River from Hartford, Conn., to Holyoke, Mass.

1. The following report on the preliminary examination of the Connecticut River from Hartford, Conn., to Holyoke, Mass., is submitted in compliance with the river and harbor act of March 4, 1913.

PHYSICAL CHARACTERISTICS.

2. The Connecticut River rises in the extreme northern part of New Hampshire, flows south between the States of New Hampshire and Vermont and across the the States of Massachusetts and Connecticut, and empties into Long Island Sound. The length of the river is about 345 miles and the area of its watershed is somewhat more than 11,000 square miles. It has no tributaries of especial magnitude.

3. The city of Hartford is situated on the river at a distance of 52 miles from the mouth, at the head of practical commercial navigation under present conditions. Below Hartford the river is under improvement by the United States, the project providing for a channel 100 feet wide and 12 feet deep at mean low water. This project is not completed, but in recent years a channel of sufficient depth for vessels of 10-foot draft has been regularly maintained, with but brief interruptions, by annual dredging, at a cost small in comparison with the value and tonnage of freight transported. The river is tidal below Hartford at low stages, and its slope below that point at such periods averages but 0.05 foot per mile. Tital fluctuations extend, in fact, for some distance above Hartford during low-water periods.

4. The city of Holyoke is situated about 33 miles by river above Hartford. The river between these two cities is sharply divided into three sections of different characteristics. The first section extends from Hartford to Enfield Rapids, a distance of about 11 miles. The slope of the river during low-water stages in this section increases from 0.27 foot to the mile at the lower end to 0.61 foot to the mile at the upper end. The banks are of sand and alluvium, and the material of which the bed is composed ranges from sand near Hartford to coarse angular gravel near the foot of the rapids at Enfield Falls.

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While previous surveys indicate no rock in the river bed in this section, I am informed that some there exists. This section is obstructed by shifting sand bars and has an available depth of but 2 or 3 feet at mean low-water stage.

5. The second section comprises the rapids known as Enfield Falls, at the head of which a low dam is maintained by a corporation known as the Connecticut River Co. The length of this section is 5.2 miles, and the total fall in this distance, from the general elevation of the crest of the present dam is about 35 feet at low-river stage. The bed of the river is of rock and gravel. About midway in this section the river is divided into two channels by a rocky island known as Kings Island, the only island of any size in the river between Hartford and Holyoke. Navigation around the rapids passes through a canal with locks originally constructed in 1829, which are the property of the Connecticut River Co. These locks will pass boats having a length of slightly less than 80 feet and width of 18 feet. The depth on the lower sill of the lower lock is about 3.7 feet at mean low-water stage (corresponding to 2 feet on the Hartford gauge), and it is said that boats having 5-foot draft can be passed through the locks when the river is at a sufficient height to enable them to enter the lower lock. The canal, although constructed for navigation purposes, is used for supplying water for power to various manufacturing establishments at the town of Windsor Locks. It is of sufficient capacity to accommodate any boats which can pass the locks, but its navigation is not easy on account of the swift current and the side drafts into the power intakes. At the head of the canal a guard lock is operated to protect it from rises of the river. The Connecticut River Co. has the right under its charter to charge tolls ranging upward to 75 cents for each ton of lading and 17 cents for each ton of capacity. Aside from any consideration of tolls, the locks and canal are entirely inadequate for profitable commercial navigation at the present day.

6. The third section of the river is the pool formed by the Enfield Dam, extending to the foot of the rapids below the dam at Holyoke, a distance of 16.5 miles. The three cities of Springfield, Chicopee, and Holyoke, and the town of West Springfield, are situated on this reach; Springfield and West Springfield 7 miles above the Enfield Dam, and Chicopee 12 miles above the same point. The low-water slope of this section of the river is but 0.04 foot per mile. Over the greater portion of this reach the river flows through an alluvial plain. The banks suffer little from erosion. The bed for 1½ miles above the Enfield Dam is chiefly of rock, and a small outcropping of rock also appears about 4½ miles above the dam. For the remainder of the distance the bed is of mud, sand, and gravel. The minimum depth in this reach at mean low water is now about 6 feet and the average depth is 8 or 9 feet.

7. At Holyoke a power dam, whose permanent crest is 56.5 feet above the low-water stage of the reach below, effectually prevents further navigation up the river, the locks and navigation canal formerly existing having fallen into ruins. Above Holyoke the river is crossed by the dams of several large power plants, the first of which is located at Turners Falls about 32 miles upstream.

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RIVER DISCHARGE.

8. A summary of the record of the daily discharge of the river at Holyoke for the 20 years 1880 to 1899, inclusive, has been published, and the data therein made available is considered to be more than usually reliable. Since the water power generated at Holyoke is used chiefly, if not exclusively, for manufacturing purposes, little water passes through the wheels on Sundays, and during periods of low water the flow of the stream is then stored. Excluding Sundays, the lowest mean daily discharge recorded during the 20-year period was 1,600 cubic feet per second. In but three years did the mean daily discharge fall below 2,000 cubic feet per second, and in seven years it was 3,000 cubic feet per second or more. The discharge exceeded 8,000 cubic feet per second on an average of about 180 days a year. The maximum of the mean daily discharges was 115,000 cubic feet a second, but in only nine years did the greatest mean daily discharge exceed 75,000 cubic feet a second.

9. No such reliable or extensive records of the flow at the Enfield Rapids is available. Stream gauging at Thompsonville, just above the rapids, was taken during surveys made by the Engineer Department in 1874 and in 1903, but as these dates do not fall within the period covered by the Holyoke data, the opportunity for deducing the minimum flow of a series of years is lacking. While continuous records at Hartford are available, and the discharges at that point have been correlated with the discharge at Enfield Falls, yet the tidal effects at low-water stages at Hartford render low-water discharge measurements at that point quite unreliable. The minimum observed in 1874 was 4,282 cubic feet per second, and in 1903, excluding Sundays, the minimum observed discharge was slightly under 4,000 cubic feet per second. Between Holyoke and the head of the rapids the river receives the flow of two considerable streams, the Chicopee, with a drainage area of 730 square miles, and the Westfield, with a drainage area of 518 square miles. These, with smaller streams, form a total drainage area of 1,346 square miles, from which the flow of the river is augmented, as compared with a drainage area of somewhat more than 8,000 square miles above Holyoke. The Chicopee drains a generally flat country, containing numerous ponds and reservoirs, and its flow is particularly well sustained. Estimates made by Gen. Ellis, assistant engineer, in 1874, assign a minimum discharge of 669 cubic feet per second to the Chicopee, 500 cubic feet per second to the Westfield, and a total of 53 cubic feet per second to smaller streams, making thereby a minimum increase of 1,222 cubic feet per second in this reach of the river. (Report of the Chief of Engineers for 1878, p. 303.) It appears quite evident, however, that the discharge of these streams falls at times considerably below this figure. From data contained in unpublished tables accompanying the report of Mr. Arthur J. Ober, junior engineer, of 1904, based on the investigations detailed in that report (see Report of Chief of Engineers, 1905, p. 943), it appears that the minimum week-day discharge from these streams is about 700 cubic feet per second. It is believed that this figure can be accepted as reliable. It follows, therefore, that the minimum average daily flow on week days at the Enfield Rapids is probably not less than 2,300 cubic feet per

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second in any year, and that in ordinary years it does not fall below 3,000 or 4,000 cubic feet per second. The effect of the Sunday interruption of the flow at Holyoke becomes most decided at Enfield Rapids early in the morning of the following day. On such occasions the flow was estimated by Mr. Ober, in the report referred to, as between 500 and 1,500 cubic feet per second during periods of extremely low water, and from 800 to 2,000 cubic feet per second during more normal low-water periods.

10. From a study of the comparative discharges at Thompsonville and Hartford, as determined in the survey of 1903, above referred to, the computed discharge at the latter point for various guage heights and records of gauge heights at Hartford for 19 years, and considering also the record of discharge at Holyoke, it appears that a flow of at least 10,000 cubic feet per second may be expected at Enfield Rapids on an average of 180 days in the year. On a considerable number of such days, however, navigation would be dangerous or impracticable on account of freshets or ice.

11. Between the Enfield Rapids and Hartford, the Connecticut receives the flow of the Farmington and Scantic Rivers, with smaller streams, having a total drainage area of 785 square miles. The aggregate extreme low-water discharge of these tributaries was estimated by Mr. Ober from 300 to 500 cubic feet per second. It does not appear, therefore, that under present conditions there is much likelihood of a discharge of less than 2,700 cubic feet per second in the Connecticut River below the Farmington on week days, while the minimum flow in ordinary years probably amounts to at least 4,000 cubic feet per second on week days. On Sundays and in the early morning of Mondays it appears that the flow may fall to an amount estimated as between 800 and 1,800 cubic feet per second. The records indicate that a flow of at least 13,000 cubic feet per second occurs on an average of 190 days in the year at Hartford.

RIVER STAGES.

12. Freshets come down the river every spring, usually in the months of March or April, sometimes earlier and occasionally in May. Summer floods are of record, though very rare, while floods in the late fall are not unusual. The highest flood on record is that of May, 1854, which rose at Hartford to 27.8 feet above low water (or 29.8 above zero of the Hartford gauge), and at Springfield apparently to 25 feet above the ordinary low-water stage at that time. The usual rise at Hartford is between 16 and 24 feet above mean low water, and at Springfield from 10 to 15 feet above mean low water. The banks between Hartford and Enfield Rapids, and portions of those above the rapids, are overflowed at ordinary flood stages. The area overflowed is, however, comparatively restricted, and on account of the early subsidance the flood damage is not extensive. Freshets are usually of relatively short duration, and the water does not remain higher than 11 feet above mean low water at Hartford for more than 30 days in the year on an average. Except in rare instances the river during the summer usually fluctuates from about 1 foot below to about 3 or 4 feet above mean low-water stage. The river at all stages is generally quite free from drift, but the run of ice in the spring is usually heavy.

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ICE.

13. The lower reach of the river is closed by ice for a period which averages about two months in the year. The closed season varies greatly, in some years covering but a few days and in others reaching nearly four months. A table showing the date on which the river opened and closed, from 1899 to 1910, is given in a report of the examination and survey of the Connecticut River up to Hartford, published in House Document 1294, Sixty-first Congress, third session, page 39. The pool above the Enfield Dam is closed by ice for slightly longer periods, but records of the duration of the closed season are not available.

BRIDGES.

14. Between Hartford and the probable head of navigation at Holyoke the river is crossed by 10 bridges, a brief description of which follows:

(1) *Highway bridge at Hartford.*—A monumental structure of stone, with nine arches, constructed in 1903–1908. The channel span has a width of 100 feet and clear headroom of about 38 feet at mean low water. With but brief exceptions, the bridge will afford a clearance of 30 feet from June 1 to November 1 of each year. This bridge was authorized by the acts of Congress approved February 18, 1903, and March 2, 1905, and is under the jurisdiction of a special board of commissioners. The latter act of authorization provides for the insertion of a draw span whenever so ordered by the Secretary of War.

(2) *Railroad bridge at Hartford.*—Iron truss, originally constructed about 1849. Its clear height at mean low water is 30 feet. This bridge has a nominal draw span, but the draw is of such dimensions and so located that it would not be useful to future navigation. It is owned by the New York, New Haven & Hartford Railroad Co.

(3) *Warehouse Point, Windsor Locks.*—Suspension highway bridge of steel, constructed in 1886. As it is above the entrance to the Enfield Canal, present navigation does not pass under it. The clear headroom afforded by this bridge and the following one will depend upon the nature of the improvement which may be made in the lower portion of Enfield Rapids, which they span. Originally a toll bridge, it has been purchased by the State and is now a public bridge.

(4) *Warehouse Point railroad bridge.*—Steel plate girder, with one truss span, reconstructed in 1904. This bridge crosses the canal and the portion of the river not now used for navigation. It is owned by the New York, New Haven & Hartford Railroad Co.

(5) *Thompsonville highway bridge.*—Steel truss, built 1892–3. Clear height above mean low water, 21 feet. Now a county bridge.

(6) *South End Bridge, Springfield.*—Highway, steel truss, built in 1878, raised in 1903. Height at mean low water, 37.8 feet. A county bridge.

(7) *Old toll bridge, Springfield.*—Highway, covered wooden truss, built in 1812. Clear height at mean low water, 18.7. Its condition is such that a new bridge must be constructed in the not distant future. A public bridge.

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(8) *Boston & Albany Railroad bridge, Springfield.*—Steel truss, reconstructed about 1905. Clear height above mean low water, 28.7. Owned by the Boston & Albany Railroad Co.

(9) *North End Bridge, Springfield.*—Highway, steel truss, built in 1876. Clear height above mean low water, 24 feet. A county bridge.

(10) *Chicopee Bridge, Chicopee.*—Highway, steel truss, build in 1904. Clear height above mean low water, 28 feet. It was completed in 1904–1907 by the board of county commissioners of Hampden County, Mass., under authority of act of Congress approved April 28, 1904. The permit issued by the Secretary of War under the act provides for the construction of a draw when so ordered.

In addition to these bridges, three others cross the river above the probable head of navigation.

PREVIOUS IMPROVEMENTS.

15. The Connecticut River was the early highway by which the central portions of New England were reached. During the first part of the last century steamboats regularly plied between Hartford and Springfield and other upriver points, and a steamboat freight service continued until about 1882. As the boats were necessarily small and of exceedingly light draft, the freight rates were high. I am informed that during the last three years of this service the rate from Hartford to Springfield was 70 cents per ton, out of which 10 cents per ton toll was paid at the Enfield Canal. On account of the rates necessarily charged, the business could not meet railroad competition and was discontinued. During the year 1909 the Springfield Navigation Co. attempted to renew water transportation, but the venture could hardly be considered successful. An account of the difficulties encountered is published in House Document No. 818, Sixty-first Congress, second session, pages 22 to 26. Navigation above Hartford is now limited to the operation of excursion steamboats and motor boats in the pool above the Enfield Dam.

16. The difficulty experienced in the navigation of Enfield Rapids by flatboats and steamboats led to the incorporation of the Connecticut River Co. in 1824, "for the purpose of improving the boat navigation of Connecticut River." As an incident to this purpose, the company was empowered to hold such mill or mill seat or manufactures as they might judge expedient. The company constructed and has maintained the locks and canal at Enfield Rapids, which have been described, and in connection with such improvement has developed certain water powers and extensive industries in the town of Windsor Locks, partly dependent upon such power. The continued existence of the company is obviously due to the revenues received from these water powers. The charter of the company, with its various amendments, is printed in House Document No. 818, Sixty-first Congress, second session.

17. The improvement of the river above Hartford was undertaken by the United States in 1871 and continued at intervals until 1886. Operations were limited to the portion of the river below Enfield Rapids. Six low wing dams were constructed at various bars and a limited amount of dredging was done. While these works appear to have been of some benefit, yet the character of this reach is such

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that no material improvement can be expected except from improvements far more extensive than could be undertaken with the funds appropriated.

PREVIOUS EXAMINATIONS AND SURVEYS.

18. The references to the reports of previous examinations and surveys of the Connecticut River between Hartford and Holyoke are as follows:

Date.	Congressional document.				Annual reports of Chief of Engineers.	
	House or Senate.	Number.	Congress.	Session.	Year.	Page.
1871–1874	House...	101	Forty-fifth....	Second..	1878	[1] 248
1897	...do.....	[1] 136	Fifty-fifth.....	...do.....	1898	976
1904	...do.....	[1] 231	Fifty-eighth...	Third...	1905	899
1905	...do.....	323	Fifty-ninth....	Second..	.....	.....
1908	...do.....	1,311	Sixtieth.....	...do.....	.....	.....
1910	...do.....	818	Sixty-first.....	...do.....	.....	.....

[1] With maps.

Elaborate surveys of the river were made in connection with the reports of 1871–1874 and of 1904, the results of which are set forth in those reports with their accompanying maps. The physical conditions have changed little since the latter date.

19. Numerous plans for the improvement of the river are presented in the reports listed in the preceding paragraph. The report of 1872 contained five alternative plans, of which one providing for passing the Enfield Rapids by a canal on the east bank was given preference. In the following year a revised plan was submitted, in which, on account of the difficulty of improving the river between Hartford and the rapids, it was proposed to continue the lateral canal to the mouth of the Hockanum River, below Hartford. The estimated cost of the latter plan was $2,306,345.

20. In 1897 a plan was submitted by Col. Leach, Corps of Engineers, for the improvement of the river by canalization. (H. Doc. No. 136, 55th Cong., 2d sess.) It was proposed to build three locks and movable dams and to excavate where required to secure a channel 150 feet wide and 9 feet deep. The first, or upper dam, was provisionally located 3½ miles below the existing Enfield Dam at Kings Island; the second was to be 1.1 miles farther downstream, near the foot of the rapids; and the third dam was to be located just below the highway bridge at Hartford. Possible damages to existing water powers at Windsor Locks and at Holyoke were carefully considered, and it was concluded that the proposed dams would not impair the water power at Holyoke, since the level of the existing pool would not be raised, and that the damage to the water powers at Windsor Locks would be trifling in any event, and could be entirely compensated for by an increase in the level of the fore bays. The estimated cost of the improvement was $1,825,000.

21. This plan was reviewed and revised by a special board of engineers in 1904. (H. Doc. No. 231, 58th Cong., 3d sess.) Because of

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the foundations developed by the detailed surveys of the sites of the locks and dams, the estimated cost of the plan previously proposed was placed at $3,740,000. The board submitted three alternative plans for securing a channel 10 feet deep and 200 feet wide:

First. Canalization by three fixed dams, with suitable sluiceways, in approximately the positions previously recommended, except that the lower dam was to be placed about 1¼ miles farther upstream, to obtain less expensive land for the lock sites and to avoid overflowing park lands in Hartford. The cost under this plan was estimated as $2,725,000.

Second. The excavation of a channel by dredging from Hartford to the foot of the rapids, with two locks and dams to surmount the falls, at an estimated cost of $2,621,000.

Third. A lock and dam, with a lift of 10 feet, about 1½ miles above Hartford, to afford a channel to the foot of the rapids, and a lock to afford entrance to the canal of the Connecticut River Co. above the mills at Windsor Locks, together with the enlargement of the canal, and the construction of a guard lock at the head of the canal, all at an estimated cost of $2,393,500.

The board did not attempt to estimate the amount of damages on account of impairment of existing water power at Windsor Locks, believing that the amount of such damages should be fixed by the courts after the improvement had been made. It appears to be evident that either the first or the third plans, with a fixed dam a short distance above Hartford, would impair this water power.

22. In 1905 the board was reconvened for "the purpose of preparing and submitting an additional report on the improvement of the river by open-channel work or methods other than those already reported on." (H. Doc. No. 323, 59th Cong., 3d sess.) The board suggested three additional plans for securing a channel 7 feet deep at mean low water and 100 feet wide. The first two plans contemplated the use of the locks and canal of the Connecticut River Co., an offer having been made by a representative of that company to adjust the locks at its own expense to "take the ordinary barges which carry coal and heavy freights." The third plan contemplated a new lock into the canal above the mills at Windsor Locks, and the use of the upper portion of the canal. The plans were—

First. Dredging between Hartford and Windsor Locks, at an estimated cost of $157,500.

Second. Dredging, with training and contracting works between Hartford and Windsor Locks, at an estimated cost of $747,600.

Third. Dredging and rock excavation with training and contracting works between Hartford and the proposed lock, together with the construction of this lock, at an estimated cost of $1,465,600.

Experience on the reach of river between Hartford and Windsor Locks having shown that a dredged channel would soon fill, the first plan was deemed impracticable. The Board of Engineers for Rivers and Harbors, in reviewing the report, recommended the third plan, provided that all rights claimed to be infringed by this work were ceded to the United States without cost. It is obvious that none of these plans would impair the water powers at Windsor Locks, but that under the first two the Connecticut River Co. could, if it chose, charge excessive tolls; and that under the third an adjustment of the rela-

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tive rights of the United States and of the Connecticut River Co. would be necessary.

23. In the report of 1908 (H. Doc. No. 1311, 60th Cong., 2d sess.) the estimates of the plan recommended in the previous report were revised to include the necessary enlargement of the portion of the canal which was to be utilized, and the guard lock at its head. The Connecticut River Co., however, under date of December 7, 1908, formally declined to cede to the United States without cost the rights claimed by it and no further action was recommended.

24. In the report of 1910 (H. Doc. No. 818, 61st Cong., 2d sess.), the district officer presented a plan similar to the foregoing, but with a channel of 5-foot depth, and a lock of smaller dimensions than previously recommended, at a total cost of $800,000 with $8,000 per annum for maintenance, with a view to determining what use would be made of the river. In the report attention was invited to the fact that two companies, one of which was the Connecticut River Co., had applied to Congress for the privilege of constructing power dams at the Enfield Rapids. The Board of Engineers for Rivers and Harbors, in reviewing the report, expressed the opinion that a channel depth of 5 feet is not sufficient to meet the needs of navigation that would be expected to develop in the river, and recommended the adoption of a channel with a depth of 7 feet, to be secured by open-river improvement as far as Windsor Locks, at an estimated cost of $1,015,600, under the following conditions:

First. That a suitable lock and dam for surmounting the Enfield Rapids be constructed by private or corporate interests, free of cost to the United States.

Second. That navigation through said locks shall be free from any toll or charge.

Third. That those constructing the lock and dam assume all responsibility for claims for damages that might arise from flowage rights, from injury to water power, or from any other source.

Fourth. That after construction the lock shall become the property of the United States and shall be maintained and operated at the expense of the Federal Government.

These recommendations were concurred in by the Chief of Engineers.

PROSPECTIVE COMMERCE.

25. An extended canvas of the commercial statistics of the territory in the State of Massachusetts which would be benefited by an improvement of the reach of the river under consideration has recently been made by the Connecticut Valley Waterway Board, appointed by the governor of Massachusetts. The statistics in the following paragraph are taken from the published report of that board. These quantities parallel, to a large extent, those collected by a similar State board and presented in the report of 1897. (H. Doc. No. 136, 55th Cong., 2d sess.) Those here quoted are believed to be of assured reliability.

26. The three cities of Holyoke, Chicopee, and Springfield, and the town of West Springfield, had an aggregate population of 181,281 in 1910, as given in the United States census, compared with a population of 114,389 in 1895. The population of the towns in Connecticut

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bordering the river above Hartford was 19,612 in 1910, giving an aggregate population of 200,893 affected by the improvement. The assessed valuation of the four first-mentioned communities in 1912 was $230,581,374, compared with $103,393,020 in 1895; the combined total value of goods made in 1911 was $99,489,139, compared with about $47,000,000 in 1895. The total freight tonnage, as reported by the railroad companies operating in the territory, is shown in the following table:

Total freight tonnage in 1897 and 1912.

	Received.		Forwarded.		Total.	
	1897	1912	1897	1912	1897	1912
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Springfield	738,706	1,153,650	323,313	273,065	1,062,019	1,426,715
Holyoke	441,479	851,286	144,926	263,660	586,405	1,114,946
Chicopee	40,157	78,952	11,495	17,287	51,652	96,239
West Springfield	36,652	[1] 339,000	24,132	1,000	60,694	340,009
Total	1,256,994	2,422,888	503,866	555,012	1,760,770	2,977,909

[1] Of the 339,000 tons received at West Springfield, 324,000 tons was "company freight," of which approximately 280,000 tons was coal, a large part of which was used on locomotives running out of West Springfield.

27. The commerce which will be particularly benefited by an improvement of the waterway is that in bulk freight, and particularly in coal. The figures of the Connecticut Valley Waterway Board as to the consumption of this commodity are believed to be somewhat large. From the report of the railroad companies on the amount of coal transported to Springfield, and from a comparison with reliable statistics of coal consumed at other cities in the vicinity, I am of the opinion that the total coal consumed by the cities and towns bordering on this portion of the river is under 1,000,000 tons per annum, and that about one-third of the total is used by the several railroads. The portion of this coal which would be carried by water, were sufficient facilities afforded, is difficult of determination. A certain portion is received at the sidings of manufacturing establishments which are not conveniently located with respect to the river, and this portion would undoubtedly continue to come by rail; but if the railroad rates were not reduced to fully meet water competition, as now appears unlikely, the greater part of the remainder would eventually be brought by water. On the lower river, despite the lower rail rates on coal there prevailing, between 400,000 and 500,000 tons of coal per annum are delivered by water. The total population of the cities and towns on the lower river was 156,295 in 1910, compared with 200,893 on the reach under consideration, and manufacturing industries are considerably more developed in the latter section. It appears reasonable to anticipate therefore a water-borne traffic in coal amounting to about 600,000 tons per annum at the present time. If the communities bordering the river continue their present growth, this amount should increase in the future.

28. Other bulk freight, which may be expected to use the waterway, includes building material, paving, molding sand, water and sewer pipe, fertilizer, and other similar commodities. On the lower river the tonnage of such freight transported by water amounts to

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about 20 per cent of the coal, and this percentage prevails in other localities in this district enjoying water transportation. Such miscellaneous bulk freight may be expected to reach 100,000 tons per annum in this section of the river.

29. Providing that suitable draws are inserted in the existing bridges, a steamboat service to New York may be expected to follow an adequate improvement. The benefit to be derived from this service is more the indirect advantage of prompter delivery than a reduction in the cost of transportation. That this advantage is a very material one is, however, evident from the large use made of steamboat facilities on the lower river, where the rates are the same by rail and by boat.

30. The present rail rates on coal in carload lots are as follows:

Rail rates (carload lots).

	From mines to—			
	Perth Amboy.	Hartford.	Springfield.	Holyoke.
Bituminous (Cumberland)	$1.55	$2.50	$2.60	$2.70
Anthracite (prepared)	1.50	2.45	2.75	2.80

I am informed by the general manager of the Hartford & New York Transportation Co. that the rate by water from tidewater points, such as Perth Amboy, to Hartford, is 60 cents per ton in barges alongside the wharf. With an adequate channel the charge for the further haul to Springfield and Holyoke, the passage of one or more locks considered, should not exceed 15 cents per ton, making the total water freight 75 cents per ton. The rates on coal by rail and water, and the resulting reduction in cost, are then as shown in the following table:

	Springfield.		Holyoke.	
	Estimated rate.	Saving.	Estimated rate.	Saving.
Bituminous	$2.30	$0.30	$2.30	$0.40
Anthracite	2.25	.50	2.25	.55

It may be thought that a portion of this saving would be counterbalanced by the greater cost of discharging from barges as compared with the cost of dumping from cars. I am informed by a large operator that the two costs are practically the same. The total cost of discharging from barges, with a well-equipped plant, is but from 7 to 12 cents per ton; consequently under any assumption the saving through a water haul would be very considerable. The saving in freight on other bulk commodities would probably be greater than the saving in the rate on coal.

31. The existing rail rates on classified freight from New York to Middletown, Hartford, Springfield, and Holyoke, and the steamboat rates to the first two named points are identical. It can not be ex-

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pected, therefore, that the improvement of the river would affect any considerable reduction in the rates on package and miscellaneous freight. As has been pointed out, however, the advantage of prompt delivery would be very material.

32. In view of the preceding considerations, it appears a reasonably conservative estimate to place the financial return from an improvement of this waterway at from $200,000 to $300,000 per annum, with the prospect of increased return if the communities continue their present growth. A very considerable expenditure on the improvement is therefore justified.

NECESSARY CHANNEL DEPTH.

33. In order that a commerce may be developed of magnitude sufficient to justify the necessary cost of the improvement, it is obvious that the depth of the channel must be sufficient for economical navigation. The necessary depth is evidently determined by the nature of the commerce and the character of vessels that must be used. In character the inward commerce will consist principally of bulk freight, such as coal, building material, etc., the greater portion of which will come from New York Harbor and adjacent points, and the outward commerce will be package freight destined to the same point for distribution. It can hardly be expected that such traffic will develop if it be subjected to transshipment en route, for it is doubtful whether the economy in water carriage would compensate for the cost of such transshipment, the incidental delay would be most prejudicial, and the necessity for special facilities and equipment would lead to restrictive monopoly. Similarly no extensive commerce can be expected if vessels must discharge a portion of their cargo before proceeding up the river, for the necessary adjustment of shipments would subject the traffic to great inconvenience. If the improvement of the river is to be commercially successful, steamboats and barges must be able to proceed from New York to their river destinations without breaking cargo, and these vessels must consequently be suitable for navigation in Long Island Sound. Experience has amply demonstrated that barges suitable for safe and economical navigation in the sound should be of at least 9 feet draft; and this draft is, as a rule, exceeded. The barges on the river below Hartford are loaded to a draft of from 9 to 10 feet, carrying thereon from 700 to 825 tons. The steamboats plying between Hartford and New York have a draft of 10½ feet. While it is possible to work a vessel into a harbor on a draft nearly equal to the channel depth, it would not be commercially practicable to navigate a 20 or 30 mile reach of river without water under the keel. There is little question that a channel about 12 feet in depth will be necessary to accommodate vessels of the character required for the prospective commerce.

34. It is suggested that the approaching completion of the New York State Barge Canal will give rise to the construction of a large additional number of vessels of 10-foot draft, many self-propelled, and that advantage of opening this portion of the Connecticut River to these vessels is very material.

35. Those interested in the improvement have expressed a desire for a channel even with as little depth as 5 feet, partly in the thought

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that a commerce could be developed on such draft, and partly with the view that such an improvement would demonstrate the commercial benefits to be attained by a deeper channel, and lead to further expenditure for a greater depth. For the reasons that have been detailed, I am strongly of the opinion that the commerce developed would be very disappointing, and that neither purpose would be fulfilled. It is probable that plans for a 5-foot and a 12-foot channel would be radically different in character, and that a large part of the expenditure made to secure the lesser depth would not be useful for the greater improvement.

TERMINAL FACILITIES.

16. The existing navigation above Hartford is so small that no terminal facilities, other than landings for excursion and pleasure boats, exist. There is, however, ample frontage available for such terminals at Chicopee and Holyoke. The report of the Connecticut Valley Waterway Board shows that at Chicopee about 4,000 linear feet of river frontage is in railroad ownership, and 38,500 in private ownership. Much of the latter is suitable for the construction of terminals. At Holyoke no river frontage is owned by railroads, about 2,000 feet is in municipal ownership, and about 56,400 in private ownership. There is ample land suitable and presumably available for terminals. The same situation exists at West Springfield. The city of Springfield is not so fortunate. Out of the length of about 13,400 feet fronting deep water within the city limits, 8,600 feet is owned by the New York, New Haven & Hartford Railroad Co., and is nearly entirely occupied by its tracks; about 3,500 feet, all or nearly all of which has been acquired for park purposes, is owned by the municipality; and about 1,300 feet remains in private ownership. There is an additional frontage of about 10,000 feet on shoal water, comprising about 2,900 feet owned or leased by the railroads, of which 1,500 feet is occupied by tracks; about 3,100 feet in municipal ownership, including streets and street ends; and about 4,000 feet privately owned. As a measure of the frontage required for terminals, it may be stated that at Hartford about 4,000 feet is used for that purpose. In the last report upon the proposed improvement, reference was made to the movement then on foot at Springfield to move the railroad tracks to the opposite side of the river, and convert the city water front into a park. A commission has the entire subject of transportation and water-front questions under consideration. I am informed by them that no definite plans are as yet decided upon, but that due provision will be made for the needs of water transportation. It is obvious that the necessary terminal facilities can be provided at Springfield by condemnation of the riparian rights of the frontage held by the railroads, if necessary, and by bulkheading and filling a sufficient area beyond their tracks; or by dredging a channel to the area not so occupied. The cost will, however, be considerable. The advantages accruing from water transportation are strongly appreciated in Springfield and it may be anticipated that the necessary expenditures will be made to provide facilities for handling the commerce, should the improvement of the river be undertaken by the General Government.

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WATER POWER.

37. The development of water power is closely related to the improvement of the river for navigation. The reach whose improvement is most difficult and costly is the Enfield Rapids, where, as has been described, there is a fall of about 35 feet in a distance of about 5 miles. A dam and lock at the lower end of the rapids offers a very satisfactory solution to the improvement of this reach. As the mills at Windsor Locks use but a portion of the flow of the river, the dam will make available a large and valuable water power. While the cost of the dam and accessory works, and of the flowage rights, will be heavy, it has been considered that the revenue from the sale of the power is sufficient to yield a profitable return on the investment.

38. In the past few years several companies, including the Connecticut River Co., have applied for congressional authorization of a dam at this site for the purpose of water-power development. The latter applicants have been prepared to construct a suitable lock without cost to the United States and to conform to the other conditions recommended by the Chief of Engineers in the review of the last report upon the river, as detailed in paragraph 24 of this report. The situation in regard to water powers on navigable streams has been such that none of these applications have been granted, but it is understood that renewed application for authority for the construction of this dam will be made.

39. While the improvement of navigation and the development of water power at Enfield Rapids are coordinate in their general features, yet the demands of the two interests run contrary in detail. For navigation it is essential that a channel of adequate depth be constructed to the entrance to the locks and that the current velocity in this channel be moderate. Could the dam be located at the foot of the rapids, these two requirements could be met with comparative ease. A dam at this point would, however, flood the town and mills at Windsor Locks and would occasion such extensive damage to property that the site can not be considered. The lowest point at which a dam has been proposed is a mile and a half above the foot of the rapids, and in some of the plans for the development of power a site 2½ miles above the foot has been chosen. The present fall at low water in these distances is from 9 to 18 feet. Most of the plans proposed have contemplated the excavation of a channel through a portion of this distance to serve the double purpose of a tailrace for the wheels and an approach to the lock, but in none of these plans has the bottom of the channel been placed at a sufficiently low elevation to afford an adequate depth of water for navigation.

40. The depth to which the approach channel must be carried is evidently dependent upon the means adopted for improving the reach below the rapids. If it were attempted to improve this reach by open-channel regulation, the depth would be dependent upon the slope that the water surface would assume after improvement. The low-water discharge of the river is comparatively small under present conditions, and will be at times smaller after the water-power development is in operation, as it may be presumed that during hours of minimum power demand a portion of the flow will be stored. As the bed in this reach is unstable, it would not be feasible to restrict

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the channel to a fixed cross section, and the average cross section would be far larger than the minimum secured. A very material reduction in the slope of this reach, with a consequent lowering of the mean low-water level at the foot of the rapids, is therefore to be anticipated if a channel of the necessary dimensions were secured by open-channel regulation. The depth to which the approach channel to the foot of the lock must be carried would be much greater than has heretofore been proposed, and the cost of this excavation, much of which would be in rock, would be excessive. In order, therefore, to secure the necessary channel to the lock, it appears necessary to resort to canalization of the reach below the rapids, by means of a lock and movable dam at some point above Hartford. Such a dam would impair, to some degree, the water power of the proposed development during low-water periods, but of the crest elevation were duly limited, the damage would be comparatively small, and would appear properly and necessarily consequent to the improvement of the river for navigation.

41. A certain conflict of interests between water power and navigation also exists above the proposed dam. It is obviously to the interest of navigation that the level of pool above the rapids be maintained at as high a level as is possible, in order that the dredging necessary to secure the desired channel depth be reduced to a minimum. The maximum elevation of the pool is fixed by the requirement that it shall not interfere with the water powers of the mills above at Holyoke. The limiting height of the present dam, or of any new dam constructed by the owners thereof, is fixed by an order and decree of the Circuit Court of the United States for the District of Connecticut, passed June 16, 1884, in the case of the Holyoke Water Power Co. *v.* The Connecticut River Co., a copy of which is appended. It appears that while this height has been and is now exceeded, the former company has taken the necessary legal measures to preserve its interests in question. The upper limit of the pool is thus fixed, presumably at level below that which it now has. In the operation of the proposed water-power development at Enfield Falls, the primary power, which commands a considerably greater price than the secondary power, can be increased by storing the flow during hours of minimum power consumption for use during hours of maximum consumption. This storage can be effected only as a consequence of a previous reduction in the pool level during hours of maximum consumption. I am informed that this ponding of the water is regarded as essential to the successful commercial development of the power. Its importance is shown by the fact that the flow secured by drawing down the pool 1 foot would produce, with a 30-foot fall, in the vicinity of 10,000 horsepower for 8 hours. The cost of increasing the depth of the channels above the dam, to afford uninterrupted navigation during the hours when the pool is drawn down, would be great. I do not understand that the companies proposing to construct and operate the dam are prepared to bear this burden. An interruption of navigation during certain hours is not, however, unduly detrimental to barge traffic, and it is possible that even steamboat lines could so arrange their schedules as to operate with success under these conditions. It may be found sufficient to provide channels of the required depth at full pool level only. The utilization of the water power at Enfield Rapids would manifestly be of great

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benefit to the neighboring communities, and on this ground, as well as in consideration of the fact that the construction of the dam necessary for the utilization of this power would materially reduce the cost of improving the river for navigation, it may be considered proper to permit such drawing down of the pool as is essential to the commercial utilization of power.

ADVISABILITY OF IMPROVEMENT.

42. Although the channel depth herein proposed is somewhat greater than has heretofore been recommended, there appears to be little doubt that such improvement is feasible. The lift of the movable dam necessary to canalize the portion of the river below the rapids would be moderate, and the supplementary excavation required in the upper portion of this reach could be kept within due bounds. The natural channels in the pool above the Enfield Rapids show great permanence, and it is expected that no difficulty will be experienced in maintaining therein channels of the proposed depth. The advisability of the improvement is therefore reduced to the question of its cost.

43. In view of the large and important commerce that may be expected to result from its improvement, I am of the opinion that the Connecticut River, between Hartford, Conn., and Holyoke, Mass., is worthy of improvement by the General Government, if a channel of adequate depth can be secured, in connection with the development of power, at a reasonable cost; and I recommend that such detailed surveys and estimates as are necessary to determine this cost be authorized. As extensive data is now available, no general survey of the river is considered necessary.

G. B. PILLSBURY,
Major, Corps of Engineers.

[First indorsement.]

OFFICE OF DIVISION ENGINEER, NORTHEAST DIVISION,
New York, N. Y.

To the CHIEF OF ENGINEERS:

Concurring in the recommendations of the district engineer officer.

W. M. BLACK,
Colonel, Corps of Engineers.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
July 30, 1913.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. For reasons stated herein, the board concurs with the district officer and the division engineer in recommending a survey in order to determine the extent and advisability of such improvement as may appear practicable in conjunction with any power development at Enfield Rapids that may be authorized by Congress.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

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DECREE OF COURT IN THE CASE OF THE HOLYOKE WATER POWER COMPANY VS. THE CONNECTICUT RIVER COMPANY.

At a stated term of the Circuit Court of the United States for the District of Connecticut and the Second Circuit held at the city of New Haven on the fourth Tuesday of April, A. D. 1884, to wit, on the 16th day of June, 1884.

Present, the Hon. Nathaniel Shipman, judge.

THE HOLYOKE WATER POWER CO.
v.
THE CONNECTICUT RIVER CO. } In equity.

This cause came on to be heard at the September term of this court 1883, and was argued by counsel, and thereupon and upon consideration thereof it is found—

That the defendants owned a certain dam across the Connecticut River at Enfield, Connecticut, said dam being about fifteen hundred and eighty-eight (1,588) feet in length, a portion of which, about two hundred and eighty-five (285) feet in length was raised in 1881 to the height, not including the fishway, of forty and 31/100 (40 and 31/100) feet above the datum plane, or imaginary horizontal plane referred to in the opinion hereinbefore given, and that said defendants claimed the right to raise the remaining portion of said dam whenever they should deem it to be necessary.

It is further found that the remaining part of said dam and which was not changed by said construction in 1881 is now and the defendants have the right to have it kept at the average height of thirty-nine and 41/100 (39 and 41/100) feet above said datum plane.

And it is ordered, adjudged, and decreed that the defendants have no right to further raise the new or old parts of said dam above their respective above-named average heights, meaning hereby that by no repairs or rebuilding the old part of said dam, including the western and eastern slopes thereof, shall be raised or rebuilt so as to exceed an average height, including said slopes, of more than thirty-nine and 41/100 (39 and 41/100) feet, and that the new dam shall not be raised or rebuilt above said average height of forty and 31/100 (40 and 31/100) feet above the datum plane.

And it is further ordered, adjudged, and decreed that the said defendants be perpetually enjoined against raising any portion of said new dam above the average height of forty and 31/100 (40 and 31/100) feet above said datum plane, and against constructing of any new dam or dams in place of the old dam to a greater average height than the average height hereinbefore mentioned of thirty-nine and 41/100 (39 and 41/100) feet; but there shall also be slopes at each end of at least two hundred feet in length at the west end and at least fifty feet at the east end, and that the plaintiff recover of the defendant its costs, to be taxed and allowed by the clerk, and that execution issue therefor accordingly.

N. SHIPMAN, *District Judge.*

SURVEY OF CONNECTICUT RIVER BETWEEN HARTFORD, CONN., AND HOLYOKE, MASS.

UNITED STATES ENGINEER OFFICE,
New London, Conn., April 15, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Survey of the Connecticut River between Hartford, Conn., and Holyoke, Mass.

1. The following report on the survey of the Connecticut River between Hartford, Conn., and Holyoke, Mass., is submitted in compliance with departmental letter of August 13, 1913, and pursuant to the requirements of the river and harbor act of March 4, 1913. Report on the preliminary examination was submitted May 28, 1913,

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and was reviewed and reported upon by the Board of Engineers for Rivers and Harbors on July 30, 1913.

2. As a very complete and accurate general survey of this section of the river has been previously made, and the maps and data thereon published in House Document No. 231, Fifty-eighth Congress, third session, operations under the present survey were limited to supplementing this data. Numerous borings were made to determine the nature of the material that must be excavated to carry out the proposed improvement and the foundations for the proposed structures; the topography of the areas affected by the construction of dams was revised and elaborated; a resurvey was made of the one small section of the river immediately above Hartford, known to have suffered material change since the previous survey; and detailed studies were made of plans for the improvement of the river and their effect on water-power development. The following maps and diagrams accompany this report:

Plate 1. Map of Connecticut River at Hartford.
Plate 2. Map of Connecticut River, Windsor Locks to Thompsonville (2 sheets).
Plate 3. Profile of Connecticut River, Hartford to Holyoke.
Plate 4. Computed water surfaces, Hartford to Windsor Locks, discharge of 3,000 and 9,000 cubic foot-seconds at Hartford.
Plate 5. Computed water surfaces, Hartford to Windsor Locks, discharge of 20,000, 40,000, and 95,000 cubic foot-seconds at Hartford.
Plate 6. Computed heights of water in tailrace of proposed power house at Enfield Rapids.
Plate 7. Flow of Connecticut River at Enfield Rapids.

A tabulation of the borings is given in Appendix B.

ENFIELD RAPIDS.

3. All plans for the improvement of the river must hinge upon the improvement of the Enfield Rapids, which lie about midway between Hartford and Holyoke, and at which the fall at low water is about 35 feet in a distance of 5 miles. Any present plan for surmounting these rapids must be coordinated with the development of the considerable water power there available, in excess of the limited amount now utilized by the mills on the old navigation canal. As the head is comparatively low it must be concentrated, for modern hydroelectric development, in one fall, and the benefit of the high-water rise of the pool above the rapids must be realized. For these reasons earlier plans for surmounting the rapids by canalization in two lifts, or by a lateral canal, are no longer applicable. To make a lateral canal economically feasible, it would be necessary to restrict its water level to a comparatively low stage of the pool by guard gates, with an entrance lock, and the effect of a rise in the pool would not be gained at the power house. Under present-day conditions, therefore, the improvement of this section must be effected by a single dam and lock at the lower end of the rapids.

4. The location of the lock and dam must be governed by the desideratum of a suitable rock foundation. The borings made during the survey show that the underlying rock at the foot of the rapids first approaches the surface in the vicinity of the suspension bridge at Windsor Locks. As a dam here would be of great length, and would flood valuable property on both sides of the river, it appeared unnecessary to fully explore its foundation. Some distance upstream a

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gorge in the underlying rock was developed, running diagonally across the river in a north and south direction, and terminating a short distance below the Warehouse Point railroad bridge. The location of this gorge is clearly indicated by the borings shown on the map of the rapids, plate 2. Above this gorge rock appears at the surface and extends continuously to the head of the rapids. Inspection during extreme low water showed that the rock in the vicinity of the railroad bridge was continuous and but a few borings across the river were necessary to determine its quality. The rock here, as elsewhere in the whole reach between Hartford and Holyoke, is a soft shale sandstone, brown in color, in strata dipping slightly to the east and northeast. The surface rock is not sound, but the quality improves with the depth, and it is unquestionably suitable for the foundation of a dam of proper design. Inasmuch as a suitable site for the lock and dam exists upstream of the gorge in the underlying rock that has been referred to, the question of constructing a dam across this gap may be dismissed, and the lowest suitable site for the lock and dam may be fixed as immediately downstream from the Warehouse Point railroad bridge. Plans for improvement are based on the location at this point of the lock to surmount the rapids.

IMPROVEMENT BELOW RAPIDS.

5. Between the Enfield Rapids lock site and Hartford the river has now a fall at low water of about 12 feet in the total distance of 13.2 miles, the greater part of this fall occurring in the 2 miles intervening between the site for the new lock and the existing entrance locks into the old canal. The river throughout is broad and generally very shallow. The available depth at low water below the old locks is but between 2 and 3 feet. Above the old locks navigation can be carried on only during a rise in the river, the depth at low-water stage being, under present conditions, insufficient for navigation of any kind. It is evident that very extensive improvement will be necessary to secure a channel from Hartford to the proposed lock of depth sufficient for present-day navigation. The choice of method lies between open-channel excavation with regulating works to assist in its maintenance, and canalization by a lock and dam just above Hartford, supplemented by dredging.

6. The depth of a channel necessary for present-day commerce was considered in the report of the preliminary examination. It was there pointed out that, to render the improvement commercially successful this depth must be sufficient for vessels of considerable carrying capacity, suitable for navigating Long Island Sound. Such vessels must have depth that they may be stiff enough to meet rough water. Experience has amply demonstrated that a normal channel depth of 12 feet is necessary for vessels of this character. This is, in fact, the present project depth of the river below Hartford, a depth certainly no greater than is necessary. The minimum width of channel may be placed at 100 feet, suitably increased at bends in the alignment. A depth of 12 feet at the chosen low-water datum and width of 100 feet, has therefore been selected for the channel dimensions. An enlargement in width is necessary, as will later be shown in the portion of the channel immediately below the lock site.

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OPEN-CHANNEL IMPROVEMENT.

7. It is apparent that the excavation of an open channel of the dimensions proposed, through the shallow reach between Hartford and the lock site at Enfield Rapids, will greatly reduce the existing slope of the river at low-water stages, and that the computation of the amount of material that must be removed to secure the channel must be based on the predicted rather than the actual slope. The predicted slope was calculated by an accepted formula, the coefficient of which was determined from the actually observed slopes, as is more fully detailed in Appendix A. The predicted total fall at low water after a channel 100 feet in width and 12 feet in depth has been excavated to the lock site, was found to be about 1.5 feet. An enlargement in the width of the channel to 200 feet, which may be foreseen, would reduce the fall to 1 foot. It may be observed that the predicted slope is approximately the same as the natural slope of the river below Hartford. It is evident that with so slight a slope any still greater enlargement of the channel, either in consequence of the action of the regulating works or future increase in the project, could not reduce the slope sufficiently to be of material consequence to navigation, nor could a diminution of the flow have such effect. On the other hand, when the surplus water power at the rapids is developed the discharge of the stream through the power plant must be varied to meet the fluctuating demand for power, with the result that the flow through this section of the river will, during considerable daily periods in the low-water season, fall below the present minimum flow, for which the slope was computed. A slope exceeding 1 foot in the 13.2 miles considered can not, therefore, be expected. The mean low-water datum, after open-channel improvement has been effected, is therefore taken as sloping from its present established height of +2 feet above Hartford datum at Hartford to +3 feet above Hartford datum at the proposed lock site.

8. On account of the diminished slope of the water surface, the portion of the channel extending through the lower part of the rapids to the lock site will be deeply cut into the bed of the river, and must consequently carry the entire river flow up to moderate discharges. It must therefore be given a cross section sufficient to pass this flow with current velocities suitable for navigation. The channel width estimated necessary to this end, the effect of variations in flow on account of the operation of the power house being considered, is 250 feet at the upper end, gradually decreasing to the normal width of 100 feet opposite the present locks into the old canal. For the basis upon which these widths were determined, reference is made to Appendix A.

9. The material to be excavated for the channel was reasonably well explored by borings made during the survey, and was found to be sand from Hartford to Bissells Ferry, 7.3 miles; sand, loose gravel, and soft clay, with a small amount of soft rock, from this point to the foot of the old locks, 3.6 miles; compact, heavy gravel and soft brownstone rock through the lower rapids. In the approach to the lock site, through the gorge in the bedrock that has been described, the material is again loose gravel. The estimates of cost are based on disposing the sand and loose gravel hydraulically on the

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shoals of the river. Rehandling will probably be necessary to dispose of the material in the lower rapids. The heaviest rock cut in the rapids is so located that it can probably be advantageously excavated in the dry behind a coffer.

10. In order that the channel may be maintained at a reasonable cost, dikes will be necessary to direct and confine the flow and to prevent the excavated material from being washed into the channel during floods; and revetments will be required to prevent the confined flow from cutting the opposite banks. It may be expected that much of the rock and heavy gravel excavated from the lower rapids will go into these works. The lines of these dikes must be regulated by trial and experience, and detailed estimate of their cost can not well be made in advance. The length of river to be so treated is 11 miles, and the cost, after full consideration of the subject, is placed at $50,000 per mile.

11. The cost of the open-channel improvement of the section from Hartford to the foot of the guide wall of the proposed lock at Enfield rapids is, then, estimated as follows:

Hydraulic excavation, 3,400,000 cubic yards, at 16 cents	$544,000
Rehandled material, 650,000 cubic yards, at 50 cents	325,000
Rock, 115,000 cubic yards, at $3	345,000
	1,214,000
Regulating works	550,000
Administration, superintendence, and contingencies, about 15 per cent	266,000
Total	2,030,000

CANALIZATION.

12. The canalization of the river between Hartford and the lock site at Enfield Rapids involves the construction of a dam and lock near Hartford (pl. 1). The site farthest downstream suitable for the construction of these works is about 1.5 miles above the Hartford Bridge. Below this point the conformation of the banks is not as suitable and the land for abutments is more expensive, while the dredging necessary to secure an open channel is comparatively light. The bed of the river here, as for some miles up and down stream, consists of a stratum of coarse sand some 15 feet in thickness, overlying soft red clay, the latter extending to rock at considerable depth. While the foundation conditions are not of the best, there is no question of the stability of a properly designed lock and dam. An alternative site, affording rock foundation for the lock, occurs at Wilsons, about 2 miles farther upstream, but the ledge dips so rapidly toward the river that it will not afford a foundation for the dam. The cost of excavating and maintaining an open channel between the two sites considerably overbalances the saving in first construction that would be realized at the upper site from the more favorable lock foundation.

13. The general plans for the lock and dam provide for a lock chamber 310 feet in usable length and 45 feet in width, conforming to the dimensions of the locks in the New York State Barge Canal. The height of lock walls is 16 feet above Hartford datum. Based on a record of 17 years, a lock of this height will be flooded but 13 days in the year when the river is otherwise navigable, on an average, and but

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22 days in the year as a maximum. The dam has a length of approximately 1,000 feet. It is designed to afford a pool elevation of 9 feet above Hartford datum and has a movable crest at this elevation, with fixed crest at elevation 6. These heights are fixed upon to secure the maximum pool height that will not injuriously affect the existing water-power development at Windsor Locks, nor restrict any future development to a greater degree than natural conditions impose. A dam with a fixed crest at the low elevation stated will have but a very trifling effect on the flood heights of the river, particularly if it be given a cross section of high hydraulic efficiency when deeply submerged. For this reason it is believed entirely unnecessary to incur the somewhat greater first cost of a dam of the movable type, with its much greater cost of operation and care. The experiments on submerged weirs made for the International Waterways Commission, and recorded in the final report of that body (S. Doc. No. 118, 63d Cong., 1st sess.), indicate a cross section from which high efficiency of flow may be expected, and this section was chosen as the basis for that of the fixed portion of the proposed Hartford Dam. In other respects the design of the dam and lock follows established practice. For the movable crest the drum-wicket type is proposed, operated in two sections to facilitate the regulation of the pool. The estimate of cost of the lock and dam is as follows:

Lock	$225,000
Dam:	
Fixed parts, 1,000 feet, at $265	265,000
Movable parts, at $30	30,000
Abutment	30,000
Cofferdam and pumping	75,000
Bank revetment, 10,000 feet, at $4	40,000
Lands, buildings, and power machinery	50,000
Superintendence and contingencies, about 15 per cent	110,000
Total	825,000

14. The pool created by the dam must be improved by dredging to secure a channel of 12-foot depth and 100-foot width. As with the open channel, the width must be increased in the lower rapids in order to accommodate the flow at velocity suitable for navigation, but this enlargement need not be carried so far. The channel widths estimated as necessary decrease from 250 feet at the entrance to the Enfield Lock to the normal width of 100 feet at a point somewhat downstream from the suspension bridge at Windsor Locks. The estimated cost of excavating this channel is as follows:

Hydraulic excavation, 1,400,000 cubic yards, at 18 cents	$252,000
Rehandled material, 230,000 cubic yards, at 50 cents	115,000
Rock, 17,000 cubic yards, at $3	51,000
Superintendence and contingencies, about 15 per cent	62,000
Total	480,000

The higher unit price is assigned to the hydraulic excavation under the canalization plan on account of the smaller quantity to be excavated.

It is further estimated that the sum of $100,000 can be profitably expended in the construction of dikes, training walls, and revetments to reduce the cost of maintenance.

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15. The total cost of canalization, from Hartford to the lock site at Enfield Rapids, is therefore—

Lock and dam	$825,000
Channel excavation	480,000
Regulating works	100,000
Total	1,405,000

The estimated first cost of the improvement of the reach by canalization is, therefore, but approximately two-third of the estimated initial cost of the open-river improvement. To the difference in cost of the two plans of channel improvement must be further added the cost, estimated at $75,000, of additional lift of the lock at the rapids made necessary by the open-channel improvement.

COMPARISON OF PLANS.

16. The cost of maintenance under the two plans is difficult to forecast. But little previous dredging has been done in this section, and the channels that have been excavated were quite narrow and of comparatively slight depth, so that they modified but slightly the circumstances of the river flow. A channel dredged in 1873, 35 feet in width and 4.5 feet in depth, through a shifting bar about 3 miles above Hartford is reported to have filled before the next season. A channel of approximately the same dimensions, dredged in 1909 by the Springfield Navigation Co., through a gravel bar farther up the river, remained open for a number of years, and was last summer restored by that company at small cost. The tendency of the current to follow and clear the channels now proposed would be far more marked, on account of their much greater size, and such channels would not fill to the same relative degree. Below Hartford, the amount of material that is dredged yearly from the bars to maintain the 12-foot channel, averages about 100,000 cubic yards, the total length of channel where dredging is required there aggregating 5 miles. The depth of shoaling during freshet rarely exceeds 2 feet at any place. For the proposed channel above Hartford the length of dredged cut will be much longer, and the natural depth of the river far less. On the other hand, the material at the upper end of the reach is much heavier, and will be reasonably stable even under the spring floods. The regulating works provided for in the estimate will go far toward preserving the channel, and the comparatively great amount of material will justify the employment of a dredge of high efficiency. I believe that the estimate for maintaining the open-channel improvement from Hartford to the Enfield Lock site can be placed, with reasonable safety, at $45,000 per annum; and the cost of annual dredging necessary to maintain the channel in the canalized river at $30,000 per annum. The cost of the operation and care of the lock and dam may be placed at $10,000, so that the total cost of maintenance and operation, under the canalization plan, is $40,000. It may be seen, therefore, that, so far as concerns the item of maintenance, the difference between the two plans is not great. It might, indeed, be thought that the pool formed under the canalization plan would gradually fill, rendering its maintenance eventually nearly as costly as that of an open channel. It may be confidently

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predicted that such will not be the case. At flood stages, during which alone shoaling of moment occurs, the dam will create a mere local disturbance of flow. At such stages the currents and velocities of the river will be unaffected by it except in its immediate vicinity, where a slight increase of velocity will occur. There is no progressive shoaling in the pool above the existing Enfield Dam, and none may be expected as a consequence of the erection of the proposed Hartford Dam.

17. So far as concerns their relative advantages to navigation, there is likewise little to choose between the two plans. The freer navigation in the pool provided by canalization will be offset in large degree by the delay and inconvenience of lockage. Canalization will afford greater facilities for delivering fertilizer to the rich farm lands that border the river and will improve the navigation of the lower reaches of the Farmington River, making it possible for small cargoes to reach the town of Windsor on that tributary. It will incidentally add greatly to the attractiveness of this reach of the Connecticut for pleasure boating. It must, nevertheless, be recognized that the community affected might, as a whole, prefer the open-channel method, in the prejudice that a fixed dam, however low, would increase the flood heights to an injurious extent.

18. The improvement of the river below the rapids by canalization can therefore be accomplished at much less cost than by open-channel improvement, its maintenance will probably be somewhat less costly, and it will afford somewhat greater advantages to navigation. With a dam of the height proposed it will not materially injure the water power already developed at the Enfield Rapids, nor will it restrict the development of additional power to a greater degree than natural conditions now impose. On the other hand, the open-channel improvement would create a new and artificial condition in the river by which the available head at a future water-power development would be increased, particularly in low-water periods, with a consequent increase in power. An investigation into the amount of this additional head was believed desirable, with a view to determining whether its value would be sufficient to justify the adoption of the open-channel method under a plan of cooperation with the company operating the power plant under which the latter might secure the advantages of the open-channel improvement by bearing its added cost.

19. To determine the consequences of the various plans, the slopes of the river at various discharges were calculated, for the open-channel improvement, the canalized improvement, and the river in its present condition improved only by a tailrace at the power plant. The amount of tailrace excavation that a power company would find profitable for power purposes alone depends upon a number of none too definite elements. The decision as to the extent of the tailrace excavation that would be profitable if no improvement of the river for navigation was involved would depend largely on the judgment of the hydraulic engineer designing the plant. Very extensive tailrace developments are quite rare. For the purpose of this computation there has been taken a development approximately equivalent to that shown in the plan presented in 1909 by the Northern Connecticut Power Co. (printed in H. Doc. No. 818, 61st Cong., 2d sess.),

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differing therefrom only in that the bottom width was made 300 feet, with a more direct alignment. The plan presented by that company was drawn with a view to meeting navigation requirements as well as those of power. Further study indicates, indeed, that it would have fulfilled the first end but imperfectly; but it is very doubtful whether a greater development would ever be made for power only. The computations of the water slopes under this development and under the two comprehensive plans for navigation improvement were made by methods detailed in Appendix A, with the results shown on plates 4, 5, and 6.

20. From these diagrams it will be seen that the effect of any plan considered on the existing water powers at Windsor Locks will be small. The mills developing the power draw the water from the old navigation canal and discharge it through separate tailraces into the lower rapids. The elevation of the tailraces have been plotted on the diagrams. All lie above the proposed pool surface at low discharge. To avail themselves of the additional fall available at low water between the tailraces and the surface of the river in the natural channel, or of the greater fall that would be afforded after the river was improved by the open-channel method, it would be necessary for the mill owners to incur the very large cost of excavating deep tailraces through the ledge which lies along the west bank of the river, and probably also to incur an annual expense in clearing these cross-channels of deposits. This fall has not been availed of, and it may be assumed that the cost of realizing it is prohibitive. The canalization of the river, so far as the existing water power is concerned, would therefore merely absorb that portion of the head which the mills can not profitably utilize, and would consequently cause them no injury whatever.

21. The effect of the several methods of improvement on a future comprehensive development of water power is shown on plate 6, prepared from the data shown on plates 4 and 5. This diagram shows the heights of water in the tail-bay of the power house of such a development, corresponding to any given river discharge, under the various plans. It will be noted that the computed river heights are practically the same for the improvement by canalization as for power development only. The extensive channel excavation included in the former compensates for the backing up of the water by the dam. At very low flows, to be sure, a loss of head amounting to about 1 foot is indicated, but such flows are of but brief duration and produce but a very limited amount of power in any event. The open channel improvement of the reach from Hartford to the lock and power house on the scale contemplated will, on the contrary, increase the available head at the power house by as much as from 2 to 5 feet through a considerable range of river discharge.

22. To arrive at an estimate of the benefit to be gained by an increase of head, which varies quite rapidly with the amount of discharge, it is necessary to ascertain the amount and distribution of the discharge. Since no extended records of the discharge of the Connecticut at the Enfield Rapids have been made the carefully kept records made by the Holyoke Water Power Co. of the discharge at Holyoke, 18 miles upstream, for the 20-year period, 1880–1899, are used for this purpose. The drainage area above the rapids exceeds

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the drainage area above Holyoke by 15½ per cent of the latter, and the Holyoke discharges were accordingly increased by this percentage to give the discharge at the rapids. The Holyoke data is largely based on computations of the water passing through the wheels of the Holyoke mills. The tendency of such determinations is to give too low results. A direct comparison of the Holyoke discharge with measured discharges at Enfield is given in Appendix A. Without going into further details it may be said that, in fact, the Holyoke records show a lower flow per square mile than any other records in the lower part of the river. As they are, however, the best long-term records at a near-by point, and as they underestimate rather than overestimate the flow, they are believed the most desirable basis for the present computations. To present them in a convenient form the discharges for the 20-year period were arranged in order of magnitude, giving the duration curve of discharge shown on plate 7.

23. From the data presented it may very readily be shown that the average gain in head secured for a future development of water power at the Enfield Rapids by the adoption of the open-channel improvement of the reach between Hartford and the lock at the rapids will be about 2.8 feet. The total available head with the river in its natural condition, or after its improvement by canalization, will normally be in the vicinity of 30 feet, so that the relative gain in head will average about 10 per cent. It by no means follows, to be sure, that the power, and more particularly the value of the saleable power, will follow the same ratio as the head. The largest gains in head occur at low discharges when the power affected is the least and the gain in the total annual power proportionately less than at higher discharges. A computation of the amount of saleable power, either absolute or relative, gained by the adoption of the open-channel plan, can be made only after the determination of a number of features of the development, such as the capacity of the plant, the operating-load factor, and the extent to which the new development will supplant the wheels now installed on the old navigation canal, all of which are largely dependent upon the circumstances of the market. Tentative estimates, based on reasonable assumptions, show that the adoption of the open-channel improvement will increase the saleable power by an amount somewhat less than 10 per cent but not greatly differing from that figure. The average gain of 2.8 feet in head may be taken, therefore, as an index of the value of the open channel from the water-power standpoint. The expenditure necessary to realize the additional head may be summarized as follows:

Excess cost of open-channel improvement	$625,000
Added cost of lock at Enfield Rapids	75,000
Added cost of draft tubes and tail-bay excavation at power house	75,000
Total	775,000

I believe that the benefits gained either to a private corporation or to the general public by increasing the average available head at Enfield Rapids by the moderate amount of 2.8 feet would not justify this expenditure. Adequate cooperation by private interests to secure the open channel improvement in lieu of improvement by canalization is not therefore to be anticipated, and the latter plan is consequently that best suited to the conditions.

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24. In view of the heavy excavation necessary to secure a river channel through the lower rapids to the site of the lock, the thought may suggest itself that a lateral canal to serve navigation through this reach might accomplish the end at less cost. Even preliminary investigation shows, however, that such is not the case. The length of canal required would be approximately 2 miles. A lock at the proposed Enfield Dam could not be dispensed with, as a guard lock would be necessary even were the canal carried at the upper pool level. The estimated cost of the river channel through the lower rapids under the canalized plan is $180,000. Taking into consideration the initial cost of constructing two locks instead of one, and the cost of acquiring the land and excavating a canal of the required length, it is immediately apparent that the initial expense of the lateral canal would exceed the cost of the river channel. Excluding the improvement of the lower rapids, the estimated cost of the channel from Hartford is practically the same whether open-channel improvement or canalization be adopted, so that the cost of an open channel to the foot of the rapids, with a lateral canal to the dam, would considerably exceed the cost of canalization. A lateral canal consequently offers no advantage in first cost, and the operation and care of the added lock would be more costly than the maintenance of the river channel.

IMPROVEMENT ABOVE THE RAPIDS.

25. The section from the rapids to the head of navigation at Holyoke has a gentle slope and a depth exceeding, in some reaches, that desired. Neither its initial improvement nor its maintenance offer any unusual features. Through the greater portion of the rapids the pool created by the proposed Enfield Dam will afford the necessary depth. In the upper part of the rapids and immediately above the present Enfield Dam there will be a considerable length of shallow rock excavation, in soft brownstone, necessary to gain the required depth. Above this all indications and all probings show that sand only will be encountered.

26. The mean low-water pool elevation of the existing Enfield Dam is 40.9 feet above Hartford datum. The limiting height of the dam as fixed by the court decree may, however, be interpreted to be 39.41, and this latter height has been accordingly adopted as the basis of mean low-water datum on which estimates of excavation are based. The mean low-water slope can not differ materially from that of the present pool. This slope gives a total fall of but 0.4 foot in the whole distance of 18 miles.

27. The estimated cost of a channel 100 feet in width and 12 feet in depth below the pool level created by a dam at elevation 39.41, Hartford datum, is as follows:

Hydraulic excavation, 1,000,000 cubic yards sand, at 15 cents	$150,000
Rock, 85,000 cubic yards, at $3	255,000
Administration and contingencies	60,000
Total	465,000

The estimated cost of maintenance in this section is $15,000 per annum.

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LOCK AND DAM AT ENFIELD RAPIDS.

28. To complete the improvement and make it of use to navigation, a new dam, with a suitable lock, must be constructed at the Enfield Rapids. During recent years several applications have been before Congress for authority for the construction of such a dam, for the purpose of developing the considerable water power that now runs waste. Mr. Charles H. Tenney, president of the Connecticut River Co., the proprietor of the present water-power development at the rapids, states, in a letter attached, that the company is prepared to commence construction on a new dam at the foot of the rapids as soon as authority therefor is obtained. A power development of proper design and construction, built with due economy by a company having sufficient capital for the purpose, and operated under good business management, should apparently gain a reasonable return on the necessary investment, provided that the conditions imposed under the grant of authority were not unduly onerous. There is good ground for anticipating, therefore, that the dam and appurtenant lock will be constructed by private capital after the necessary authority has been granted.

29. It does not appear to the public interest, however, to rest the development of a considerable interstate commerce, of great benefit to a large community, wholly on the initiative of private interests in the development of water power. If the lock and dam necessary to surmount the rapids are not constructed by private interests within a reasonable period, and if the improvement of the river for navigation is deemed desirable, the United States could appropriately construct these works, and make the excess power thereby made available the means of producing a return on its expenditure. With this end in view, an estimate of the cost of the lock and dam, with the necessary foundations and sluices for a power house, together with an estimate of the overflow damages, is presented. These estimates are based on a lock with chamber 310 by 45 feet in dimensions, provided with intermediate gates to reduce the water consumption when passing small vessels. The height of the main lock walls is 45 feet above Hartford datum. With this elevation the lock will be usable as long as the lock in the proposed Hartford Dam is in operation. The head walls and gates are at elevation 54, to carry them above extreme flood height. The lock is located on the west side of the river immediately downstream from the Warehouse Point railroad bridge. The power-house foundations and sluices are adjacent. A diversion dam 1,700 feet in length, of which 700 feet is of spillway, and 1,000 feet retaining section, extends from the lock and power house to Kings Island; the east branch of the river being closed by spillway 1,160 feet in length, with crest at elevation 39.41, Hartford datum. Suitable head works for the present canal are included. A dike is provided to separate the tailrace and approach channel from the main river. This dike need be but of comparatively low height. At high discharges the slope of the lower river drowns out the lower rapids, and there is then no occasion for separating the tailrace and channel from the remainder of the stream. The estimate of cost of the lock, dam, and appurtenances is as follows:

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Lock	$380,000
Dams	680,000
Power-house foundations and sluices	205,000
Tail-bay excavation	150,000
Dike	10,000
Head gates into old canal	12,000
Cofferdam, pumping, temporary flumes, etc	150,000
Removal of old dam	5,000
Administration and contingencies, about 15 per cent	238,000
	1,830,000
Lands and damages	250,000
Total	2,080,000

30. The areas submerged by the erection of the dam would be limited to those between its site and the present dam, lying below elevation 39.41. The effect of the proposed dam on flood heights and the consequent area of overflowed lands is discussed in Appendix A. It is there shown that the practical effects will be also limited to the portion of the river between the new and the old dams, provided that the old dam is removed after the new one is constructed. Between these sites the banks are generally high and rocky, and but little land, and that generally of small value, would be either permanently submerged or overflowed in flood. The head at a small water power on Stony Brook, at present unused, would be greatly reduced, and changes, not involving change in the track elevation, would be necessary in a portion of the Warehouse Point railroad bridge. The estimated cost of lands and damages, exclusive of undeveloped water power, is consequently not a large figure.

WATER POWER.

31. The amount of useful power that is obtainable from the flow of the stream in excess of the flow used by the mills on the present navigation canal (taken at 1,500 cubic feet per second), and the requirements for lockage at the proposed lock (taken at 200 cubic feet per second), based on a plant of 30,000 horsepower capacity, operating at a 50 per cent load factor for 300 days in the year, is approximately 63,000,000 kilowatt hours per annum as an average, and ranges from 55,000,000 kilowatt hours in dry years to 80,000,000 kilowatt hours in years of abundant flow. The flow of the river exceeds the requirement of a plant of this capacity somewhat more than six months in the year. It is assumed that sufficient pondage will be available in the pool above the dam to permit full advantage to be taken of the flow when less than that necessary to meet the capacity of the plant. In the computations hydraulic conversion efficiency was taken at 80 per cent, electric at 90 per cent. As the value of this power at the generating station after conversion into electric energy may be taken at about 4 mills per kilowatt hour, and as the large manufacturing communities in the vicinity should offer a good market for power, a leasing charge for the water-power privileges as developed by the construction of the dam, power-house foundations, and sluices would not be excessive if based at 1.5 mills per kilowatt hour. Such a charge is approximately at the rate of $7.50 per horsepower per annum. The leasing value of the power privileges of a dam constructed for the improvement of the Enfield

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Rapids may therefore be estimated at $100,000 per annum; a sum that would in itself yield a fair return upon its cost.

32. The flow required for the operation of the proposed lock should be amply covered by the average daily draft of 200 cubic feet per second assumed. This amount will afford 40 lockages per day for a lock 310 by 45 feet in area, with the maximum lift, provided that the gates and valves are made sufficiently tight, as they can be, to duly limit leakage. While it may be expected that launches and other small craft will require the fairly frequent operation of the lock during daylight hours, in addition to the demands of commercial vessels, the use of intermediate gates for locking through such craft should keep the water consumption well within the limit stated.

PONDAGE.

33. Whether the dam be built and the power plant operated in normal course by private interests, or the dam built by the United States and the power privilege leased, the stream should be made to yield the greatest amount of useful power that can be had without unreasonably infringing upon its uses for navigation. During the periods when the flow is insufficient to continuously meet the full capacity of the plant, the operating company should be allowed to pond the water received in excess of its needs in the hours of minimum power demand for utilization during the hours when it is most useful. It is obvious that such pondage can be secured only through a fluctuation in the pool surface. The upper limit of the fluctuation, if no water is to be lost, is determined by the crest of the dam, whether it be the masonry crest or flashboards surmounting it. As the pool reaches to the tailraces of the lower Holyoke mills, the raising of the pool surface will work injury, more or less material, on those water powers. A height of crest that will do no material injury was determined by the United States district court in the case of the Holyoke Water Power Co. *v.* The Connecticut River Co. and fixed at an elevation which may be interpreted as 39.41, Hartford datum. The lower limit of the pool fluctuation must be such as will not unduly impair the navigable capacity of the waterway. Inasmuch as a considerable amount of dredging and rock excavation is necessary to secure a channel of projected depth when the pool, at the dam, stands at elevation 39.41, a certain impairment of navigable capacity will result from any reduction in pool level; but it will not be unreasonable if it subjects navigation to no greater inconveniences than are encountered in the channel giving access to the pool. On the other hand it would be unreasonable to draw down the pool below the stage at which, in its natural state, it would yield commensurate pondage. In the channel below Hartford, which must be traversed by vessels en route to the section under consideration, and in which the project depth is the same as that proposed for this section, the water falls at lowest tides during lowest flows 1.5 feet and more below its mean low level. A temporary reduction of 1.4 feet in the Enfield pool would not consequently appear unreasonable. The resulting pool surface, at elevation 38 at the dam, is, from the records, the extreme low stage of this section before the Enfield dam was closed across the river. The bed and banks of the stream have changed but little in

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the intervening years. It follows, therefore, that, with the river in its natural state, the pondage obtainable below pool elevation 38 would be substantially limited to that derived from the section below the head of the rapids, the area of which is but 24 per cent of the area of the whole stream. I believe, therefore, that the minimum elevation of the pool should be fixed at elevation 38, Hartford datum.

34. It is very probable, indeed, that the water-power company will find it inadvisable on other grounds to draw down the pool below elevation 38. A portion of the water carried by the present canal is delivered to manufacturers under long-term leases, and it may be anticipated that its delivery must be maintained. The present water surface of the canal opposite the proposed intake is a trifle above elevation 38. If the pool is drawn down below that level, expensive alterations in the canal and in the forebays of the mills will probably be required to continue the supply.

35. It may not be inappropriate to inquire whether the pondage afforded between these comparatively narrow limits will be sufficient for the profitable operation of a power plant of the character considered. Pondage will be used, (1) to utilize the whole flow of the stream up to the capacity of the generating machinery installed while supplying an hourly varying demand for power; (2) to combine in the most profitable manner the output during low flows with the auxiliary power then necessary; (3) to compensate for the irregularities introduced in the natural flow of the river by the withholding and releasing of water at upstream dams.

36. So far as the first of these features is concerned, computations show that the pondage afforded between the limits considered should be reasonably adequate. With a plant of the capacity that has been considered, 30,000 horsepower, supplying a well-distributed load, which would give as high a power factor as 75 per cent, detailed computation shows that the pondage would be adequate so long as the inflow into the pond was uniform and steady. Considering a plant of greater capacity, 40,000 horsepower, operating on the daily load curve actually realized at a similar plant (67 per cent load factor), computation shows that under these conditions the maximum loss of water, through lack of sufficient pondage, would amount to but $2\frac{1}{2}$ per cent of the discharge for the day. This loss would occur when the inflow was just sufficient to meet the average demand and would be less when the inflow either exceeded or fell short of this point. Without any pondage the maximum loss for such a plant operating under these conditions would be about 12 per cent of the discharge for the day. In these computations the varying slope of the pool from hour to hour was taken into consideration, as was also the water stored in the rise of the pool, which must be contemporaneous with an overflow at the dam. The data and method of computation are set forth in Appendix A.

37. The second feature, that of combining the water power to best advantage with auxiliary power during low flows, would, I conceive, be met if the water power is made to carry the peak of the load during such periods. If the pondage is sufficient to carry the whole of the varying load at full development it will evidently be sufficient to carry any portion of the variation at less flow. Detailed computation shows that with the actual load curve just referred to the whole

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flow could be applied to the peak of the load at low flows without loss of water.

38. As to the third feature, the irregularity in flow due to the operation of the upstream plants, it may be said that minor irregularities, such as those occurring from hour to hour, disappear in the long pool between Enfield and Holyoke. The operation of a future plant at Enfield is concerned only with the gross iregularities resulting from the closing of the headgates at Holyoke on Sundays and holidays and during times of extreme low flow. The greater portion of the Holyoke mills shut down at the close of work on Saturdays, resuming operations Monday morning. During the intervening time a considerable portion of the flow of the river is stored in the Holyoke pool. Moreover, when the flow received in that pool is insufficient to meet the amount that the various mills at Holyoke draw under their leases with the Holyoke Water Power Co., and the pool is consequently drawn down to an undesirable level, the headgates of the power canal are closed and the pool is allowed to fill. Nearly the entire flow of the river is then shut off. It is stated that the maximum duration of such interruptions is about 36 hours, and the number of interruptions in a year has not exceeded 18. As a considerable part of the power generated at the proposed plant at Enfield will probably be sold for manufacturing purposes, the interruption of the Sunday and holiday flow will be most seriously felt on the following mornings in the hours required for the flow released from Holyoke to reach Enfield. More pondage than can be secured by drawing down the pool to elevation 38 will probably be required to afford advantageous operation of the plant and to preserve to the output its due value on the mornings following Sundays and holidays and on working-day interruptions to the normal flow of the river if the crest of the dam is limited to elevation 39.4. Should such be found the case, the situation has, nevertheless, a remedy, for sufficient additional pondage to carry the plant over such interruptions could be secured by placing flashboards on the dam. Such a course would be a matter for private agreement or judicial adjustment and is beyond the scope of the present report. It is sufficient to point out that the question of obtaining sufficient pondage without drawing down the pool below elevation 38 is not an insuperable obstacle to power development.

39. As to the consequential effect of pondage in reducing the flow below the dam during the hours of storage, it may be observed that such reduction, with the improvement of the river below the rapids secured by canalization, will be immaterial. An entire temporary cessation of flow could have but little effect on the channel depths. It will be unnecessary, therefore, to regulate, in the interest of navigation, the amount of water released.

SUMMARY OF COST.

40. The total cost of initial improvement, supposing that the dam and appurtenant lock are constructed at the Enfield Rapids by private interests, is—

Below rapids, by canalization	$1,405,000
Above rapids	465,000
Total	**1,870,000**

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The cost of maintenance is estimated at $45,000 per annum. The cost of the operation and care of the locks at the Hartford and Enfield Dams, and of movable crest of the former, is estimated at $20,000 per annum. The total cost of upkeep is therefore estimated at $65,000 per annum. Should the United States construct the lock and dam at the Enfield Rapids the initial cost would be increased by $2,080,000, making the total cost $3,950,000, with an expected return for the lease of water power of $100,000 per annum.

COMMERCE.

41. The prospective commerce to be developed by the improvement was set forth in the report of the preliminary examination, paragraphs 25 and 32. It was there stated that a commerce amounting to about 700,000 tons per annum is to be anticipated, and that the saving in freight by an adequate system of water transportation, over the present rail cost, would be in the vicinity of $200,000 per annum. A copy of the report of the Connecticut Valley Waterway Board, reviewing the expected commerce in more detail, is attached. (Appendix C.) This sum is nearly twice the aggregate of the estimated cost of annual upkeep of the improvement and interest on the initial improvement at the rate of 4 per cent. No new facts have developed since the submission of the preliminary examination to alter these conclusions. There is no question that the communities affected have a present rail commerce in commodities appropriate for carriage by water exceeding the figure given. On the adjacent lower section of the river from Hartford to the mouth such commodities are actually carried by water despite the lower rail rates there offered. The industrial situation in the section above Hartford is entirely similar, and its commerce has the same markets. With a channel provided as proposed, of the same capacity as that below Hartford, I see no reason for doubting that the expected traffic will be realized in the reach between Hartford and Holyoke, if suitable terminal facilities are provided for the handling of water-borne commerce.

TERMINAL FACILITIES.

42. As the waterway in its present condition is entirely inadequate for commercial navigation of any amount, there are no existing terminals for the economical and expeditious handling of freight, and for its storage and distribution. A canvass of the possible sites for such terminals is set forth in the report of the preliminary examination, from which it is apparent that, although especial and somewhat costly means will be required to secure the terminal facilities at the city of Springfield, there are no insuperable difficulties to the establishment of these features at any locality. From one viewpoint the lack of present structures is not without its compensating opportunities. The ground is clear for the adoption of comprehensive and coordinated plans for water-front development. It can not be gainsaid that full advantage should be taken of this opportunity. All experience proves that this advantage can be fully realized and continuously preserved only when the control of the proper frontage is acquired and retained by the municipality or other agency responsible to the citizens of the community. Without proper terminal facilities

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for handling the commerce, it is obvious that no commensurate benefit will be secured from the large expenditure necessary to improve the waterway for the use of commerce. I believe, therefore, that the United States may properly, and should, assure itself that these facilities will be provided before entering upon this expenditure. As a considerable amount of time must elapse, after the improvement of the waterway is begun, before it has progressed sufficiently to afford the means of commercial navigation, it would be unreasonable to require the completion of the terminals, or even the acquirement by the municipalities of the necessary land and riparian rights, before the work of the United States is commenced. The United States should, however, require that the plans be perfected, enabling legislation enacted, and funds fully provided for the construction of adequate publicly controlled terminal facilities at Holyoke, Chicopee, and Springfield before commencing its own work; and should, further, have proper assurance that the acquirement of the lands and rights and the erection of the structures will be prosecuted contemporaneously with the improvement of the channel. That the general interest may be duly conserved and protected, the decision of the adequacy of the plans for the terminal improvements and of the sufficiency of the means for putting these plans under execution should rest with the Secretary of War.

COOPERATION.

43. In a recent report of a board appointed by the State of Massachusetts to investigate the improvement of the Connecticut River, and designated the Connecticut Valley Waterway Board, it was recommended that the State of Massachusetts, if necessary, should cooperate with the cities and towns of that section of the Commonwealth by making sufficient appropriations for defraying a part of the cost of doing such work as may be required by plans and projects which may be adopted by the Federal Government for providing ample facilities for navigation. The Board of Harbor and Land Commissioners of Massachusetts inform me, in a letter attached, that no definite plan of cooperation has been decided upon. I conceive it to be one of the functions of the present report to suggest and recommend a distribution of the cost of improvement which will be equitable in view of the benefits conferred. It is most evident that especial benefit will be conferred on the cities and towns bordering the river in the States of Massachusetts and Connecticut. Those in Connecticut are of relative small size. Their interest in navigation, though proportionately the same as the interest of the communities in Massachusetts, is not of such actual magnitude as to give ground for belief that active cooperation is to be anticipated from the State of Connecticut or local interests therein. By far the greater portion of the expenditure must, however, be made for works within the borders of Connecticut. But little work, comparatively, is necessary within the State of Massachusetts. Indeed, of the gross total estimated cost, but $125,000, or about 7 per cent of the whole, is for work in that State. While, again, especial benefit in cheaper rates will accrue to the communities immediately affected, the conduct of the actual business of transportation may very likely be in large part

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prosecuted from New York, and the profits of transportation accrue to citizens of that State. I am constrained to the opinion, therefore, that it is but equitable that the General Government bear the entire cost of the interstate improvement of the main river channel, and that the cooperation of the State and of local interests be directed to the construction of municipally controlled terminals, branch channels thereto, and harbor basins, and other local facilities for navigation, the cost of which, if adequately executed, will be in no inconsiderable ratio to the cost of the main channel. The fact need not be overlooked that a necessary consequence of the improvement will be the alteration of a considerable number of bridges, which would, in their present condition, unreasonably obstruct navigation of the character suitable for the improved river. Under the law, the cost of these alterations will be borne by local interests.

44. While the cost of the proposed improvement is great, the resulting benefits are, I believe, fully commensurate with the expenditure. It is my opinion, therefore, that the Connecticut River, between Hartford and Holyoke, is worthy of comprehensive improvement by the United States, under a project providing for a channel 12 feet in depth at mean low water, and generally 100 feet wide, to be obtained by the construction of a lock and dam at Hartford, and by channel excavation, with regulating works of limited extent, at a total estimated cost, for first construction, of $1,870,000 (if and when a lock and dam are constructed by private interests at the Enfield Rapids), and at an estimated annual cost of $45,000 for the maintenance of the channels, and $20,000 for the operation of the locks and dam. If a lock and dam at the Enfield Rapids are not constructed within a reasonable time by private interest, it is my further recommendation that they be constructed by the United States, at a further cost of $2,080,000, and that the privilege of developing the incident power be leased. I recommend, however, that the necessary appropriation be made subject to the provision that no work be done by the United States upon the project until the Secretary of War is satisfied that suitable and adequate terminal facilities, under municipal or other public control, will be provided at the cities of Springfield, Holyoke, and Chicopee, by the time that the project is completed.

45. If the project be adopted by Congress, the work should be prosecuted at a rate sufficient to insure its entire completion in five years. The construction of the Hartford Lock and Dam must precede all other work, and should be covered by a single contract. To these ends it is necessary that the initial appropriation be $520,000, with authority to enter into contracts to an additional sum of $300,000. Subsequent appropriations, after meeting the contract authorization, should be $350,000 yearly for three years. If the lock and dam at Enfield Rapids be constructed by the United States, the work should be covered by a first appropriation of $1,080,000, and contracts for the additional sum of $1,000,000 should be authorized, the funds to meet which should be appropriated during the following year.

G. B. PILLSBURY,
Major, Corps of Engineers.

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[First indorsement.]

DIVISION ENGINEER, NORTHEAST DIVISION,
New York City, May 1, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. Forwarded.

2. The subject matter of this report has been discussed on the ground by myself and the district engineer officer. In his technical discussion I fully concur. Upon the economics of the situation, I think there is room for further discussion. In a report dated October 31, 1908 (H. Rept. No. 1311, 60th Cong., 2d sess.), Maj. Taylor (now colonel) discusses this side of the question. He states:

> While it is probably a fact that the main object of the improvement in past years has been a means of regulating freight rates [the context shows that railroad freight rates are meant], nevertheless the conditions that arose during the year 1907 showed the great value that those improvements would have in the commerce carried. * * * In the matter of coal the supply ran so low that the company which supplies gas to Springfield was compelled to obtain its fuel for daily use in the open market at retail prices wherever it was practicable to obtain it, and that it more than once appeared that the company might be obliged to practically cease operations on account of lack of fuel. * * * It is possible that the conditions which arose during that year may arise at any time in the future, and in view of this condition the importance of the improvement of this section of the river has taken an entirely different aspect from what it had before.

I think the importance of fuel supply to a city of the size of Springfield must be very carefully considered in connection with possible congestion of railroad traffic.

3. If the United States builds the Enfield Rapids Dam, as suggested by the district officer under certain conditions, the present Windsor Locks Canal will draw water from the pool created by the United States dam to an extent estimated at 1,500 cubic feet per second. (See par. 31, within report.) If contingencies arise which curtail this supply or the owners of the canal desire more than 1,500 cubic feet per second, questions may come up as to whether the United States has taken property or water rights without compensation. If the dam and lock be built and the power created thereby be utilized by a private corporation, that corporation can be required by the law permitting construction to make provisions to quiet such claims. This is a valid argument in favor of construction by such parties rather than by the United States direct: reduced outlay on the part of the United States is a stronger reason for preferring to have the beneficiaries of the power pay for the dam creating the head at Enfield Rapids. The fall at the Hartford Dam creates a power of small commercial value, entirely incommensurate with the cost of the dam. The building of that lock and dam by the United States is probably unavoidable if the 12-foot project to Springfield, Mass., be adopted by Congress. Any law appropriating funds to build this dam should in terms permit the leasing of all resulting power, so far as the needs of navigation permit. The United States would thus secure all that is possible from the small head produced by the dam.

4. The district officer discusses in paragraphs 33 to 39 the question of pondage, to which special attention is invited.

5. I concur in the district officer's discussion in paragraphs 42 to 44 of the question of terminal facilities and cooperation.

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6. In paragraph 44 the district officer concludes that the river is worthy of the expenditure at this time of $1,870,000, "if and when a lock and dam are constructed by private interests at the Enfield Rapids," and of the annual payment of $45,000 for the maintenance of the channels, and $20,000 for the operation of the locks and dam. If the Enfield Dam be not so constructed within a reasonable time he believes this part of the river worthy of the additional expenditure by the United States of $2,080,000, the resulting power to be leased. An annual rental of $100,000 is reported as not improbable. I think that before any expenditure is made by the United States the question of the Enfield Dam must be definitely settled. Experience elsewhere has shown that the leasing of power created by Government dams at an equitable rental per annum is at best uncertain. I do not believe the United States should undertake the improvement of this section of the river, unless the entire cost of construction of the power dam and lock at Enfield Rapids be borne by private, municipal, or State funds, and the use of all water needed for navigation purposes be deeded to the United States by the parties operating the dam for power purposes. The lock should be maintained and operated by the United States.

7. If the Enfield Dam matter be satisfactorily arranged along the above lines, I believe that the estimated annual saving (about 7¼ per cent) of $200,000 in freight costs would justify the expenditure of $1,870,000 for the United States part of the cost of giving 12 feet to Springfield, with $65,000 operating and upkeep charges per annum.

8. There are no subjects undiscussed above and by the district officer which could "be properly connected with such project * * * in a logical and proper manner * * * to lessen the cost of such improvements and to compensate the Government for expenditures made in the interest of navigation, and to their relation to the development and regulation of commerce."

FREDERIC V. ABBOT,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors on survey, see p. 3.]

APPENDIX A.

METHODS OF COMPUTATION.

1. *Predicted mean low-water surface resulting from the excavation of a channel 12 feet deep and 100 feet wide from Hartford to the proposed lock site at Enfield Rapids.*—The computation was based on Kutter's formula. The coefficient of roughness was determined by trial, from the observed slopes at stage of 3.15 feet on the Hartford gauge. At lower stages the river height is determined by the tide and not by the discharge. The discharge corresponding to this stage from the rating curve determined during the 1904 survey is 9,000 cubic feet per second. The observed slope of the river, as determined during that survey, was compared with the slopes computed by applying the formula to successive sections of the river 1,000 feet in length, using different coefficients. The coefficient selected as a result of this comparison was 0.025. Using this coefficient the slopes were then similarly computed, section by section, for the river as it would be after a channel of 100-foot bottom width, with side slopes of 1 on 4, had been excavated to a depth of 12 feet below the computed water surface; taking for the discharge 3,000 cubic feet per second (reduced to 2,340 feet above the mouth of the Farmington River) and beginning with the initial

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elevation of the established mean low-water stage at Hartford (+2 on the Hartford gauge). A second computation was made for a bottom width of 200 feet. The results are shown on plate 4, together with the check computation of the slope of the river in its condition as it stood during the 1904 survey. It will be noted that slopes of the check computation differ materially in places from the line shown as the observed slope. The latter was, however, determined by gauge readings at Hartford, Wilsons, Bissels Ferry, and the old locks, only, and the observed slope shown is consequently merely the mean slope between these points. The computed elevations at these observing points agree closely with the observed elevations, and there is every reason to believe that the intermediate slopes, if actually observed, would have shown a reasonably close agreement with those computed. Below Wilsons the divergence is due to the difference in elevation of the starting point, which is a function of the state of tide at Hartford, and is immaterial.

2. *Necessary channel width in the lower rapids.*—The height of stage in the lower rapids was determined as described in a succeeding paragraph, necessary enlargements in width being assigned to carry the channel flow at a mean velocity not exceeding 4 feet per second. As these stages apply to steady flow, while the operation of the power plant will create rapid changes in the discharge, the final determinations of necessary width were based on the limitation of the mean velocity to 4.5 feet per second with a river stage as established by a steady discharge one-half that for which the velocity is computed. The consequent surface velocity would be approximately 4 miles per hour.

3. *Backwater head of proposed Hartford Dam during high discharges.*—The estimates of cost of the dam are based on a section similar to the experimental weir shown in the report of the International Waterways Commission. (S. Doc. No. 118, 63d Cong., 1st sess.). Using the coefficients there determined for such a weir, the computed heads are as follows:

Discharge, cubic feet per second.	Elevation of water surface downstream (Hartford datum).	Head.	Elevation of water surface upstream.
20,000	6.8	2.5	9.3
40,000	10.9	.8	11.7
95,000	17.4	.5	17.9

The bank-full stage of the Connecticut at Hartford may be taken at 16 feet. Extreme flood stage at Hartford is 28 feet.

4. *Backwater effects of various plans for improvement between Hartford and the lock site at the Enfield Rapids.*—Plates 4 and 5. The lines shown as the "Observed slope, natural river," are the actual river slopes as determined by the 1903–1905 survey, corresponding to the river discharges at Hartford noted. The lower discharges were taken from the rating curve at that place as determined in 1903–1905; the higher discharges, beyond the limits of that curve, from the rating table published in the Annual Report of the Chief of Engineers for 1878, page 357. While the latter table is not based on enough observations at the gauging station to be entirely reliable, it is probably sufficiently so for present purposes. The observed slopes, to the end of the assumed tailrace, just below the suspension bridge at Windsor Locks, represent, therefore, the slope of the river below the tailrace for the river improved for power only. They are continued by the line marked "tailrace," which is the computed slope of the water in a tailrace of the dimensions assumed. In computing the slopes in this tailrace and in other channels through the lower rapids the formula in its usual form $V=C\sqrt{rs}$ would have given unreliable and erratic results, as the cross section of the river, instead of being of the usual and normal shape, here takes the shape of a deep and narrow excavated channel in a broad and shallow natural section. Observing that the slope in the two portions must be the same, and assuming that the above formula applies to each separately, its modification to fit the combined section becomes $s=Q^2/(AC\sqrt{r}+A'C'\sqrt{r'})^2$; where A and A′ are the areas of the two sections, C and C′ the appropriate coefficients, and r and r' their hydraulic radii, respectively.

This modification was used in computing all slopes through the lower rapids. For the highest and lowest flows on the diagrams, plates 4 and 5, the observed

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slope of the river flowing over its natural bed in the lower rapids is shown, records of these alone being available. The slopes shown for the "improved river" are those for a river improved by the excavation of an open channel of the dimensions stated in the body of the report, 12 feet deep at the predicted low-water datum and generally 100 feet wide. These were computed by Kutter's formula, applied to sections from 1,000 to 5,000 feet in length, the coefficient of roughness being taken at 0.025. The discharge was decreased above the mouth of the Farmington River to 78 per cent of the original discharge. For discharges of 40,000 cubic feet per second and higher, corresponding to stages exceeding 10 feet on the Hartford gauge, it was assumed that the improvement would not materially affect the slope except in the lower rapids.

The slopes shown for the "canalized river" are interpolated between computations made for two tentative heights of the crest of the proposed Hartford Dam, one with movable crest at 8 and the second with movable crest at 10. The results of the preliminary computations indicated that the former was unnecessarily low, while the latter was undesirably high, and the mean, 9 feet, was therefore chosen as the appropriate height. It was assumed that the movable crest, 3 feet in height in each case, will be manipulated in such manner as to keep the pool surface at the assumed crest elevation until it reaches this elevation with the entire movable crest down, which will occur when the flow attains a volume of about 15,000 cubic feet per second. While this result can not, indeed, be fully realized in practice, the assumption should approximate average conditions. At higher flows the pool height is determined by the overflow head of the fixed dam. For discharges of 3,000 and 9,000 cubic feet per second the slopes were computed by Kutter's formula in the same manner as the slopes for the river improved by an open channel, as above described. For higher discharges, at which there would be no wide discrepancy between the pool surface and the surface of the natural river, the slopes were computed by comparison with the latter, section by section, by the formula $h' = (A/A')^2(r/r')^{\frac{4}{3}}h$, in which h is the observed fall in the section considered, A the mean of the end areas, and r the mean of their hydraulic radii, and H', A', and r' the corresponding quantities for the river as modified by the dam. This method elliminates the liability of error through incorrect assumptions as to the volume of discharge and the coefficient of roughness, the assumptions on which it is based being only that the discharge follows the Chezy formula, and that the coefficient of that formula varies as the sixth root of the hydraulic radius. Where the new circumstances of flow are entirely similar to the former, as in the present case, it should give reliable results. The slope in the section above the old locks was, however, in all cases computed by the same method as that used in computing the slopes of the assumed tailrace in order that the results might be strictly comparable.

5. *Comparison of discharge of river at Holyoke with measured discharge at Enfield, 1903–1905 survey.*—During the 1903–1905 survey, current meter observations were made at Thompsonville, just above the head of the rapids. Following is a comparison of the discharges at this point, as derived from these measurements, and the discharges at Holyoke, as furnished by the Holyoke Water Power Co. for 14 individual days during 1903:

Date.	Discharge, Thompsonville.	Discharge, Holyoke.	Ratio, $\frac{\text{Thompsonville.}}{\text{Holyoke.}}$
1903.			
July 23	14,200	8,450	1.68
24	14,200	9,250	1.54
25	12,000	8,800	1.36
28	7,500	5,200	1.44
Aug. 1	8,200	5,500	1.49
7	14,200	8,300	1.71
Sept. 2	10,500	6,700	1.55
3	8,200	5,700	1.44
4	7,500	5,350	1.40
10	6,800	4,300	1.58
11	6,200	4,350	1.42
12	6,200	3,850	1.61
16	5,500	3,450	1.59
Oct. 3	4,300	3,600	1.19
Average			1.50

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6. *Effect of the proposed Enfield Dam on extreme flood heights in the river.*—As the proposed dam will be located some 3 miles downstream from the existing dam, it is important to determine the height to which floods will be raised in the intervening portion, and whether the slope through this portion in flood will cause an increase in flood heights in the river upstream from the old dam. These heights have been computed for a flood equal to the maximum known in more than a century, that of 1854. The discharge of the flood of 1854 over the Holyoke Dam, as computed by the Francis formula, is recorded as 169,000 cubic feet per second. The accounts of the flood describe a particularly heavy and continued rainfall in the lower valley, and the flow at the rapids must have exceeded this figure. For the purpose of this computation it is placed at 212,000 cubic feet per second, or 25 per cent in excess of the flow at Holyoke. While the total length of spillway in the dam under consideration will be approximately 1,800 feet in length, the whole length can not be considered effective. The spillway designed in the section between Kings Island and the power house must be considered rather as a safeguard for the power-house and lock structures and for the railroad bridge, than an effective passage for the main body of the flow. So far as backwater effect is concerned, therefore, the main spillway in the east channel, approximately 1,200 feet in length, will probably be all that can be counted upon. With its crest at elevation 39.41, the elevation of the flood surface immediately above the dam, at a discharge of 212,000 cubic feet per second will be 53.3 feet. From this starting point the slopes and heights of the backwater were computed by the Chezy formula, $V=C\sqrt{Rs}$, for successive sections varying from 1,000 to 3,000 feet in length, dependent upon the regularity of the cross sections, to a point just above the old dam. The value of C was taken at 85, irrespective of the slope and hydraulic radius, as it was idle to attempt the determination of a more exact coefficient with the coefficient of roughness so uncertain. Above the old dam the backwater curve was derived by comparison with the recorded heights of this flood as given in the Annual Report of the Chief of Engineers for 1878, using the formula given in paragraph 4 preceding. The computed backwater curve is shown on the general profile, plate 3. It will be seen that the river slope between the new and the old sites at extreme flood will have the effect of slightly raising extreme flood heights as far upstream as Springfield. On account of the nature of the river valley, this slight increase will not be serious. The lowlands and meadows will be covered at flood no matter where and at what height the dam may be. Back of these are the secondary benches, which will be unaffected by any such slight increase in flood height. It may be observed that at and above the city of Springfield the flood heights are determined by the flow through the naturally contracted section of the river immediately below that city, and that conditions at the Enfield Rapids are comparatively unimportant.

7. *Effect of the old dam on flood heights.*—In the derivation of the backwater curve the removal of the existing Enfield Dam, after the completion of the new one, is presumed. The effect that the old dam would have on the backwater heights, if allowed to remain, is difficult to determine, as it is very irregular in profile and cross section, and the choice of proper coefficients in any formula is consequently uncertain. Using the somewhat rough general formula $h=1.5(v^2-v'^2)/2g$ (where h is the head caused by the dam, v the velocity at the dam, and v' the velocity of approach), and taking the crest to be at elevation 40.1 and its effective length 1,200 feet, it is found that the old dam would increase extreme flood heights by 1.5 feet. Its actual effect during the flood of 1854, arrived at by comparing the observed heights and slopes at the sections affected by the dam with adjacent sections, apparently resulted in raising that flood 1.4 feet. In 1854 the dam was much lower, and was not, in fact, closed completely across the river. There is good reason to believe, therefore, that the old dam, if left in place after the new one is built, would create such a disturbance in the river flow as would increase the flood heights by 1.5 feet or more. Even though this feature may not be of serious importance, plans for constructing a new dam should include the removal of the old one to prevent any unnecessary flood rise as well as to remove a menace to navigation.

8. *Effect of the new dam on moderate floods.*—Although the slope of the river between the old and the new dam sites will slightly increase extreme flood heights, the slightly lower crest of the latter, and its better design for passing floods, will counterbalance such effect at low floods. To test this feature, computations were made on the basis of the water surface on April 30, 1904, as determined by the records of detailed observations made that date. The estimated discharge on

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that day, based on the Hartford rating table (Report of the Chief of Engineers for 1878, p. 357), was 80,000 cubic feet per second. Beginning with a surface elevation of 45.7 feet at the new dam, the backwater slope was computed both by the Chezy formula and by comparison with the recorded slopes. The results were in close agreement, and the elevation reached at the old dam practically coincided with the actual recorded elevation of the water immediately above it. For such a flood discharge, therefore, the water surface above the site of the old dam will be the same as now obtaining.

9. *Yield of the pond between elevations 39.4 and 38.*—The yield from the pond will depend upon the relative slopes of the pool at the beginning and end of the period of overdraft as well as upon the difference in the elevation of the water surface at the dam. The method of computation is due to Mr. Arthur T. Safford, a well-known hydraulic engineer, who courteously furnished the daily load curves upon which the computations are based and gave as well valuable advice and data in connection with other water-power features. It is based on the following assumptions:

That the quantity flowing through the pond is the average of the inflow and outflow.

That the profile of the water surface in the pond is a straight line, and that the mean elevation consequently occurs at midlength.

That the slope is given by the Chezy formula, using therein the mean area of the pool and its hydraulic radius (assumed as the mean depth) and a coefficient of 85.

Applying the last assumption to actual observed conditions, it is found that, as a rule, the slopes obtained are greater than the observed slopes. As increases in the slope serve to reduce the pondage, the coefficient assigned appears to err on the side of safety.

The physical characteristics of the pool are as follows:

Length	miles	19.32
Area	acres	2,600
Mean width	feet	1,112
Mean depth at existing low-water level (mid-pool elevation 41.1, Hartford datum)	feet	10.7
Mean cross section at same stage	square feet	11,880

The assumed length of spillway, at the dam, was taken at 1,500 feet.

The results of the computations are given in the body of the report.

APPENDIX B.

BORINGS IN CONNECTICUT RIVER BETWEEN HARTFORD AND ENFIELD RAPIDS, CONN.

[Elevations refer to Hartford zero, established by the United States Engineer Department in 1871.]

No. 1, made in 1904.—On west bank, in Riverside Park, Hartford, near railroad bridge (pl. 1). Surface, 15.5. Fine sand to 0.5, coarse river sand to —12.5, red clay to —30.5, coarse gravel and hardpan to —37.5, fine gravel and hardpan to —41.5, brownstone to —42.7, and red slate to —44.4.

No. 2, made in 1904.—On west bank, in Riverside Park, Hartford, near railroad bridge (pl. 1). Surface, 16.1. Fine sand to 1.1, coarse river sand to —7.9, coarse river sand and fine gravel to —10.9, red clay to —31.9, gravel and hardpan to —33.9, fine gravel to —38.9, fine sand and gravel to —39.9, brownstone to —41, and red slate to —45.

No. 3, made 1904.—On east bank, in East Hartford, near railroad bridge (pl. 1). Surface, 13.9. Fine sand to 3.9, coarse river sand to —7.1, coarse river sand and fine gravel to —13.1, red clay to —58.1, gravel and hardpan to —66.6, red sandstone to —69.1, and brownstone to —69.5.

No. 4, made 1904.—On east bank, in East Hartford, near railroad bridge (pl. 1). Surface, 21.2. Fine sand to —3.8, coarse river sand to —15.8, red clay to —40.8, gravel and hardpan to —53.3, and red slate to —56.

No. 5, made 1873.—On east bank, in East Hartford, near railroad bridge (pl. 1). Surface, 21.4. Sandy loam to 7.4, sand and clay to 3.3, hard sand to 2.4, quicksand to —8.3, quicksand and red clay to —26.1, and red clay and gravel to —29.1.

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No. 6, made 1913.—In river bed at foot of west bank and 9,100 feet above Hartford (pl. 1). Bed of river, 3.1. Fine sand to —17, and clay to —31.7.

No. 7, made 1913.—In river bed 380 feet from west bank and 9,000 feet above Hartford (pl. 1). Bed of river, —1.9. Sand to —16.9, and clay to —31.9.

No. 8, made 1913.—In river bed at foot of east bank and 8,900 feet above Hartford (pl. 1). Bed of river, —2.2. Fine sand to —19.9, and clay to —34.6.

No. 9, made 1873.—On east bank, 9,900 feet above Hartford (pl. 1). Surface. 20. Sandy loam to 15.5, sand and hard clay to 10, soft wet sand to —1, blue sand and clay to —4, coarse sand to —7.1, coarse sand and clay to —30.5, clay and fine sand to —46.5, and clay and coarse sand to —70.

No. 10, made 1873.—On west bank 14,300 feet above Hartford. Location is now in river 200 feet from west bank (pl. 1). Surface, 22.5. Sandy loam to —6.5, blue sand and loam to —8.2, sand and gravel to —16.2, clay and gravel to —21.5, red clay to —57.5, yellow sand to —100, and red marl and gravel, to —100.8.

No. 11, made 1913.—In river bed 180 feet from west bank and 18,700 feet above Hartford (pl. 1). Bed of river, —4. Sand to —20 and rock below —20.

No. 12, made 1873.—On west bank below Windsor Locks and 57,400 feet above Hartford (pl. 2). Surface, 31.5. Yellow sandy loam to 26.8, gray sand and loam to 12.2, river sand to 11.5, and gravel and shelly rock to 10.2.

No. 13, made 1913.—In river bed below Windsor Locks 100 feet from west bank and 57,300 feet above Hartford (pl. 2). Bed of river, 2.9. Sand and gravel to —6, clay to —13.2, and rock below —13.2.

No. 14, made 1913.—In river bed below Windsor Locks 640 feet from west bank and 57,300 feet above Hartford (pl. 2). Bed of river, 3.6, sand to —0.6, and rotten rock to —6.1.

No. 15, made 1913.—In river bed below Windsor Locks 120 feet from east bank and 57,100 feet above Hartford (pl. 2). Bed of river, 2.5. Sand, gravel, and clay to —0.9, and rock below —0.9.

No. 16, made 1913.—In river bed, below Windsor Locks, 50 feet from east bank and 57,700 feet above Hartford (pl. 2). Bed of river, 5. Sand and clay to —3 and rock below —3.

No. 17, made 1913.—In river bed, below Windsor Locks, 260 feet from west bank and 58,300 feet above Hartford (pl. 2). Bed of river, 3.1, sand to —1, sand and gravel to —12.4, and rock below —12.4.

No. 18, made 1873.—On west bank at foot of locks, Windsor Locks Canal, 59,300 feet above Hartford (pl. 2). Surface 19.8. Sandy loam to 14.5, red clay and gravel to 3.5, and rock below 3.5.

No. 19, made 1913.—In river bed at Windsor Locks, 550 feet from east bank and 59,300 feet above Hartford (pl. 2). Bed of river, 4. Sand to —0.7, fine sand to —9.6, and sand and gravel to —19.9.

No. 20, made 1913.—In river bed at Windsor Locks, 500 feet from east bank and 60,300 feet above Hartford (pl. 2). Bed of river, 0. Hard grit and sand to —10, sand and clay to —12.4 and rock below —12.4.

No. 21, made 1913.—In river bed at Windsor Locks, 100 feet from east bank and 60,400 feet above Hartford (pl. 2). Bed of river, 5.3. Broken stone to —0.6 and rock (core) to —6.6.

No. 22, made 1913.—In river bed at Windsor Locks, 250 feet from east bank and 61,300 feet above Hartford (pl. 2). Bed of river, 2. Fine sand to —2.8, sand and clay to —3.5, and fine sand to —19.1.

No. 23, made 1913.—In river bed at Windsor Locks 340 feet from east bank and 62,600 feet above Hartford (pl. 2). Bed of river, 4.9. Sand and gravel to 0.1 and sand and gravel to —19.2.

No. 24, made 1913.—In river bed at Windsor Locks 180 feet from east bank and 62,550 feet above Hartford (pl. 2). Bed of river, 4.2. Broken rock to —8 and rock below —8.

No. 25, made 1913.—In river bed at Windsor Locks 130 feet from east bank and 62,650 feet above Hartford (pl. 2). Bed of river, 4. Sand and fine broken rock to —4, gravel to —18.4, and rock below —18.4.

No. 26, made 1913.—In river bed at Windsor Locks 580 feet from east bank and 63,400 feet above Hartford (pl. 2). Bed of river, 6.3. Gravel, sand, and clay to 1.9; sand and clay to —14.7; and rock below —14.7.

No. 27, made 1913.—In river bed at Windsor Locks 220 feet from east bank and 63,400 feet above Hartford (pl. 2). Bed of river, 6.6. Sand and clay to —16 and rock below —16.

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No. 28, made 1913.—In river bed at Windsor Locks 540 feet from east bank and 63,850 feet above Hartford (pl. 2). Bed of river, 5.9. Sand and clay to —9.2 and rock below —9.2.

No. 29, made 1913.—In river bed at Windsor Locks 100 feet from east bank and 64,550 feet above Hartford (pl. 2). Bed of river, 8.1. Sand, clay, and broken rock to —12.6 and rock below —12.6.

No. 30, made 1913.—In river bed at Windsor Locks 570 feet from east bank and 64,900 feet above Hartford (pl. 2). Bed of river, 5.7. Sand to 0.7, rotten rock to —1.3, and rock below —1.3.

No. 31, made 1913.—In river bed above Windsor Locks 250 feet from east bank and 65,600 feet above Hartford (pl. 2). Bed of river, 5.6. Sand to —0.4, broken rock to —1.9, and rock below —1.9.

No. 32, made 1913.—In river bed above Windsor Locks 180 feet from east bank and 65,950 feet above Hartford (pl. 2). Bed of river, 8.1. Sand to 0.4; sand, clay, and gravel to —2.2; and rock (core) to —6.4.

No. 33, made 1913.—In river bed above Windsor Locks 520 feet from east bank and 66,200 feet above Hartford (pl. 2). Bed of river, 4.7. Gravel to 2.7 and rock below 2.7.

No. 34, made 1913.—In river bed above Windsor Locks 470 feet from east bank and 66,300 feet above Hartford (pl. 2). Bed of river, 5. Gravel to 3 and rock below 3.

No. 35, made 1913.—In river bed above Windsor Locks 500 feet from east bank and 66,800 feet above Hartford (pl. 2). Bed of river, 7.1. Sand and gravel to —9.1; sand, gravel, and clay to —11.1; and rock below —11.1.

No. 36, made 1914.—In river bed above Windsor Locks 520 feet from west bank and 67,250 feet above Hartford (pl. 2). Bed of river, 9.2. Gravel and fine brownstone to —2, soft rock to —10.3, and rock (core) to —19.9.

No. 37, made 1913.—In river bed above Windsor Locks 700 feet from west bank and 67,400 feet above Hartford (pl. 2). Bed of river 9.6. Gravel to —10.4.

No. 38, made 1914.—In river bed above Windsor Locks 350 feet from west bank and 67,300 feet above Hartford (pl. 2). Bed of river, 10.8. Soft brownstone rock to 2.5, and rock (core) to —7.5.

No. 39, made 1914.—In river bed above Windsor Locks 400 feet from west bank and 67,450 feet above Hartford (pl. 2). Bed of river, 10.7. Sand and gravel to 8, fine sand to —4.5, soft rock to —7.7, and rock (core) to —14.6.

No. 40, made 1914.—In bed of river above Windsor Locks 570 feet from west bank and 67,550 feet above Hartford (pl. 2). Bed of river 9.4. Sand and gravel to 8 and sand and clay to —11.6.

No. 41, made 1913.—In river bed above Windsor Locks 640 feet from east bank and 67,800 feet above Hartford (pl. 2). Bed of river, 11.4. Sand to —11.2 and hardpan to —13.7.

No. 42, made 1913.—In river bed above Windsor Locks 210 feet from east bank and 67,850 feet above Hartford (pl. 2). Bed of river 12. Sand, gravel, and clay to 8.4 and rock below 8.4.

No. 43, made 1913.—In river bed above Windsor Locks 170 feet from east bank and 67,850 feet above Hartford (pl. 2). Bed of river, 12. Sand and clay to 9 and rock below 9.

No. 44, made 1914.—In river bed above Windsor Locks 340 feet from west bank and 67,650 feet above Hartford (pl. 2). Bed of river, 11.6. Sand and gravel to —5.9, soft rock to —10.4, and rock (core) to —15.9.

No. 45, made 1914.—In river bed above Windsor Locks 500 feet from west bank and 67,750 feet above Hartford (pl. 2). Bed of river, 11.5. Sand and gravel to —12.3.

No. 46, made 1914.—In river bed above Windsor Locks 550 feet from west bank and 67,950 feet above Hartford (pl. 2). Bed of river, 12.3. Gravel to 1.3 and fine brownstone and sand to —12.1.

No. 47, made 1913.—In river bed above Windsor Locks 340 feet from west bank and 67,900 feet above Hartford (pl. 2). Bed of river, 16. Hardpan to 4, clay to 0, hardpan to —8, and rock below —8.

No. 48, made 1914.—In river bed above Windsor Locks 460 feet from west bank and 68,100 feet above Hartford (pl. 2). Bed of river, 12.9. Sand and gravel to 10, sand and clay to 0, and sand, gravel, and trace of clay to —16.1.

No. 49, made 1913.—In bed of river above Windsor Locks 800 feet from west bank and 68,200 feet above Hartford (pl. 2). Bed of river 13.7. Fine sand to 8.6, sand and gravel to 5.6, and rock below 5.6.

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No. 50, made 1914.—In bed of river above Windsor Locks 540 feet from west bank and 68,350 feet above Hartford (pl. 2), Bed of river, 13.4. Sand and gravel to 10, fine sand to —3, and sand and gravel to —12.1.

No. 51, made 1914.—In bed of river above Windsor Locks 330 feet from west bank and 68,350 feet above Hartford (pl. 2). Bed of river, 14.3. Sand and clay to —1.5, and fine sand to —12.1.

No. 52, made 1914.—In bed of river above Windsor Locks 200 feet from west bank and 68,650 feet above Hartford (pl. 2). Bed of river, 14.1. Sand and gravel to 7.4, bowlder to 5.9, soft rock to 4, bowlder to 1.5, soft rock and sand to —11.3, and fine sand to —14.8.

No. 53, made 1914.—In bed of river above Windsor Locks 370 feet from west bank and 68,550 feet above Hartford (pl. 2). Bed of river, 14.5. Gravel to 12, fine sand to —6.5, and rock (core) to —16.6.

No. 54, made 1913.—In bed of river above Windsor Locks 480 feet from west bank and 68.550 feet above Hartford (pl. 2). Bed of river, 13. Hardpan to 5.5 and rock below 5.5.

No. 55, made 1914.—In bed of river above Windsor Locks 700 feet from west bank and 68,500 feet above Hartford (pl. 2). Bed of river, 13.1. Sand to 5.3 and rock (core) to —4.8.

No. 56, made 1913.—In bed of river above Windsor Locks, 540 feet from east bank and 68,450 feet above Hartford (pl. 2). Bed of river, 11. Sand, gravel, and clay to 9.5, and rock (core) to 3.5.

No. 57, made 1914.—In bed of river above Windsor Locks, 550 feet from west bank and 68,650 feet above Hartford (pl. 2). Bed of river, 13.7. Gravel to 12.5, sand and gravel to 4.5, and rock (core) to —5.4.

No. 58, made 1914.—In bed of river above Windsor Locks, 310 feet from west bank and 68,750 feet above Hartford (pl. 2). Bed of river, 14.7. Sand and gravel to 8.2, and rock (core) to —2.

No. 59, made 1914.—In bed of river above Windsor Locks, 70 feet from west bank and 68,800 feet above Hartford (pl. 2). Bed of river, 15.3. Sand and gravel to 7.3, sand to 3.6, sand and gravel to —8.3, and rock (core) to —18.3.

No. 60, made 1913.—In bed of river above Windsor Locks, 160 feet from west bank and 68,900 feet above Hartford (pl. 2). Bed of river, 17. Sand and gravel to 11.7, and rock (core) to —10.

No. 61, made 1914.—In bed of river above Windsor Locks, 330 feet from west bank and 69,000 feet above Hartford (pl. 2). Bed of river, 13.4. Fine sand to 12.5, coarse sand to 9.7, and rock (core) to —0.5.

No. 62, made 1914.—In bed of river above Windsor Locks, 180 feet from west bank and 69,250 feet above Hartford (pl. 2). Bed of river, 13.9. Gravel to 12.1, and rock (core) to 2.

No. 63, made 1914.—In bed of river above Windsor Locks, 480 feet from west bank and 69,300 feet above Hartford (pl. 2). Bed of river, 14.7, and rock (core) to 4.7.

No. 64, made 1914.—In bed of river above Windsor Locks, 470 feet from east bank and 69,450 feet above Hartford (pl. 2). Bed of river, 10.7, and rock (core) to 1.2.

No. 65, made 1914.—At edge of river on east side above Windsor Locks and 69,600 feet above Hartford (pl. 2). Bed of river, 15.9. Gravel to 14.9, and rock (core) to 4.9.

No. 66, made 1913.—In bed of river near Wilsons, 340 feet from west bank and 19,200 feet above Hartford. Bed of river, —4. Sand to —15.

No. 67, made 1913.—In bed of river near Wilsons, 390 feet from west bank and 19,250 feet above Hartford. Bed of river, —3.3. Sand to —19.3, and red clay to —33.3.

No. 68, made 1913.—In bed of river near Wilsons, 130 feet from west bank and 19,300 feet above Hartford. Bed of river, —4.1. Sand to —14.3, hardpan to —17.1, and rock below —17.1.

No. 69, made 1913.—In bed of river near Wilsons, 490 feet from west bank and 19,650 feet above Hartford. Bed of river, —3.4. Sand to —11.9, red clay to —37.4, clay and broken stone to —39, broken rock to —40.2, and rock below —40.2.

No. 70, made 1913.—In bed of river near Wilsons, 320 feet from west bank and 19,700 feet above Hartford. Bed of river, —3.3. Sand to —16.3, red clay to —26.3, sand to —30.8, and rock below —30.8.

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No. 71, made 1913.—In bed of river near Wilsons, 1,000 feet from west bank and 19,700 feet above Hartford. Bed of river, 0.5. Sand to —19.5, and clay to —51.

No. 72, made 1873.—On west bank at Wilsons and 19,550 feet above Hartford. Surface, 20.6. Sandy loam to 16.5, clay and sand to 11.8, sand and mud to 3.8, sand and gravel to 3.4, and red clay and gravel to —1.3.

No. 73, made 1913.—In bed of river near Wilsons, 120 feet from west bank and 19,800 feet above Hartford. Bed of river —3.7. Sand and gravel to —7.7, hardpan to —12.7, and rock (core) to —21.2.

No. 74, made 1913.—In bed of river near Wilsons, 260 feet from west bank and 20,100 feet above Hartford. Bed of river, —2. Sand to —16, gravel and clay to —20.9, and rock below —20.9.

No. 75, made 1913.—In bed of river near Wilsons, 530 feet from west bank and 20,100 feet above Hartford. Bed of river, —2.4. Sand to —12.5, and red clay to —33.4.

No. 76, made 1913.—In bed of river near Wilsons, 300 feet from west bank and 20,200 feet above Hartford. Bed of river, —2.4. Sand to —15.4, red clay to —19.4, sand to —26, and rotten rock to —29.4.

No. 77, made 1913.—In bed of river near Wilsons, 100 feet from west bank and 20,450 feet above Hartford. Bed of river, 2. Fine sand to —7.1, and rock below —7.1.

No. 78, made 1913.—In bed of river near Wilsons, 540 feet from west bank and 20,600 feet above Hartford. Bed of river, —3.1. Sand to —16.1, and red clay to —30.5.

No. 79, made 1913.—In bed of river below Bissels Ferry, 300 feet from west bank and 35,200 feet above Hartford. Bed of river, —0.8. Sand to —7.6, clay to —25.4, and red clay to —51.3.

No. 80, made 1913.—In bed of river below Bissels Ferry, 330 feet from west bank and 37,450 feet above Hartford. Bed of river, 0.8. Sand to —6.1, sand and clay to —19.1, fine sand to —24.1, broken rock to —25.2, and rock below —25.2.

No. 81, made 1913.—In bed of river near Bissells Ferry, 350 feet from west bank and 39,600 feet above Hartford. Bed of river, 1.8. Sand to —7.2, and clay to —21.5.

No. 82, made 1913.—In bed of river above Bissels Ferry, 400 feet from west bank and 43,100 feet above Hartford. Bed of river, 1. Sand to —8.5, and clay to —21.7.

No. 83, made 1913.—In bed of river above Bissells Ferry, 400 feet from west bank and 45,500 feet above Hartford. Bed of river, —0.4. Gravel to —2, clay to —14, and fine sand to —19.

No. 84, made 1913.—In bed of river above Bissells Ferry 490 feet from west bank and 46,450 feet above Hartford. Bed of river, —0.4. Sand, clay, and gravel to —9, and fine broken brownstone to —17.7.

No. 85, made 1913.—In bed of river above Bissells Ferry 350 feet from west bank and 47,000 feet above Hartford. Bed of river, —0.4. Gravel to —5.6 and rock below —5.6.

No. 86, made 1913.—In bed of river above Bissells Ferry 270 feet from east bank and 47,300 feet above Hartford. Bed of river, —2.3. Gravel and clay to —12.3, and rock below —12.3.

No. 87, made 1913.—In bed of river above Bissells Ferry 470 feet from west bank and 48,350 feet above Hartford. Bed of river, 0.1. Sand and clay to —3, and clay to —21.

No. 88, made 1913.—In bed of river below Windsor Locks 400 feet from west bank and 51,150 feet above Hartford. Bed of river, 3.5. Gravel to —2.7, and clay to —21.

No. 89, made 1913.—In bed of river below Windsor Locks 280 feet from west bank and 53,150 feet above Hartford. Bed of river, 0.2. Sand to —7.8, and clay to —21.

No. 90, made 1913.—In bed of river below Windsor Locks 660 feet from west bank and 55,150 feet above Hartford. Bed of river, 1.7. Sand and clay to —16.1, and soft rock below —16.1.

No. 91, made 1913.—In bed of river below Windsor Locks 200 feet from west bank and 56,800 feet above Hartford. Bed of river, 3.8. Sand and clay to —8.5, and rock below —8.5.

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APPENDIX C.

Report of Connecticut Valley Waterway Board on an investigation of the Connecticut River, March, 1913.

THE COMMONWEALTH OF MASSACHUSETTS.

To the honorable the Senate and House of Representatives of the Commonwealth of Massachusetts:

The Connecticut Valley Waterway Board, appointed under the provisions of chapter 149 of the resolves of 1912, respectfully submits this report:

The resolve provided—

"That the governor, with the advice and consent of the council, is hereby authorized to appoint three persons, residents of the Commonwealth, one of whom shall be a member of the board of harbor and land commissioners. The persons so appointed shall constitute a board to be known as the Connecticut Valley Waterway Board. The governor shall designate the chairman of the board. It shall be the duty of the board to investigate the subject of the improvement of the Connecticut River for the purposes of navigation, and to report to the next general court not later than the first day of February all facts concerning the present condition and uses of said river; what investigations, reports, appropriations, and expenditures have been made by the United States and by the Commonwealth of Massachusetts relative to the navigation of said river and the protection of the river banks; and what action, if any, should be taken by the Commonwealth of Massachusetts and the various municipalities bordering on said river or contiguous thereto, either in cooperation with the United States and the various corporations owning or controlling water rights or privileges on said river, or without such cooperation, to carry into effect such projects as may be recommended for increasing the present facilities for navigation. The board may expend a sum not exceeding two thousand five hundred dollars to meet such expenses as may be necessary in carrying out the purposes of this resolve. The report shall contain data, as follows:

"(*a*) The existence and establishment of both private and public terminal and transfer facilities contiguous to the navigable water proposed to be improved, and, if water terminals have been constructed, the general location, description, and use made of the same, with an opinion as to their adequacy and efficiency, whether private or public. If no public terminals have been constructed, or if they are inadequate in number, there shall be included in the report an opinion in general terms as to the necessity, number, and appropriate location of the same, and also the necessary relations of such proposed terminals to the development of commerce.

"(*b*) The development and utilization of water power for industrial and commercial purposes.

"(*c*) Such other subjects as may be properly connected with such project: *Provided*, That in the investigation and study of these questions consideration shall be given only to their bearing upon the improvement of navigation, to the possibility and desirability of their being coordinated in a logical and proper manner with improvements for navigation to lessen the cost of such improvements, and to compensate the Government for expenditures made in the interest of navigation and to their relation to the development and regulation of commerce.

"The board shall receive such compensation as the governor and council shall determine." (Approved June 13, 1912.)

By an order of the legislature adopted in concurrence on January 29, 1913, the time within which the board should report was extended to March 15, 1913.

The first meeting was held at the office of the board of harbor and land commissioners on August 7, 1912. Public hearings have been given in Springfield, Holyoke, Chicopee, Northampton, and Greenfield, and inspections made of the river from Springfield to its mouth in Connecticut, and of portions of the river above Springfield. Conferences have been held with the members of the rivers, harbors, and bridges commission of Connecticut, who have been entirely in accord with this movement in Massachusetts and have materially assisted the board in its inquiries. A map of the entire river in the States of Massachusetts and Connecticut has been prepared from surveys made by the United States Government, by the State of Massachusetts, and from other sources, and accompanies this report. Statistics in relation to population, valuation, and the amount and character of the various industries carried on within the more im-

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portant cities and towns bordering on the river have been collected, and other information has been gathered by personal inquiry and circular letters. The members attended a hearing in December before the Committee on Commerce at Washington relative to legislation with respect to the important subject of the relocation and construction of a dam and lock across this river at Windsor Locks in Connecticut.

At the public hearings held in Holyoke and Springfield, Gov. Foss was present and spoke of the value of the development of inland waterways, of the urgent necessity for the opening of the Connecticut River to navigation, and of the tremendous commercial importance to the State of an unobstructed waterway from Holyoke to the sea.

It is impossible to mistake the sentiment of the cities and towns of the Connecticut Valley. At every hearing the board was welcomed by audiences both large and enthusiastic. Local speakers presented strong arguments, sustained by local statistics, to prove the need of the community for waterway transportation and its inevitable commercial advantages. In addition, letters were sent to the meetings by individuals and corporations in favor of the movement. The citizens of the Connecticut valley are demanding, not only in their own interest but in behalf of the commercial prosperity of the whole State, the opening to navigation of the Connecticut River from its upper reaches to the sea.

EARLY HISTORY OF THE RIVER AND ITS USES.

The Connecticut River is for interior New England the great natural highway of commerce. From its source in Connecticut Lake, in New Hampshire, it flows southerly, forming the boundary line between that State and Vermont, thence through Massachusetts and Connecticut, emptying into Long Island Sound at Saybrook. The total length of river is about 345 miles, while its entire watershed exceeds 11,000 square miles. As a thoroughfare for trade it played in early New England history a part of tremendous importance.

By the close of the colonial period of New England history the Connecticut Valley settlements had a thoroughly organized system of transportation upon this river from Wells River Junction in Vermont to Hartford and the sea. Above Hartford flatboats plied between the various falls. It was the custom to unload freight at each fall, cart the same around the falls, and reload upon flatboats above. From Hartford and points short distances above cargoes were transshipped to sloops or barks for transportation to Boston, to New York, to Barbadoes, to Jamaica, or to England.

In the closing years of the eighteenth century, immediately following the Revolution, the development of inland waterways assumed a proportionate importance never since equalled. In the Connecticut valley plans were formulated for increasing the navigability of the river by means of a system of canals around the principal falls. Charters were issued to various companies by Vermont, Massachusetts, New Hampshire, and Connecticut. Under these charters locks and canals were built at South Hadley and Turners Falls in Massachusetts; at Bellows Falls, Sumner Falls, and White River Junction in Vermont, and, somewhat later, at Enfield in Connecticut.

The dams, canal, and locks built in this locality in Connecticut have been the subject of controversy for several years, and have been described and commented upon in reports of the United States Engineers. In the charter granted by the State of Connecticut in 1824 to the Connecticut River Co. it was provided:

"That the said corporation, for the purpose of widening the channel of said river, and deepening the same, shall have power to dig, cleanse, and remove obstructions from the channels and bars of said river, from and above the bridge at Hartford, to Springfield, and to erect and build wharves and piers and hedges in said river, or on the banks thereof; and the said corporation are empowered to lock the falls at Enfield, on said river, and to make channels to aid them, and to construct a canal on either bank of said river near said falls, and to construct a dam, or dams, for the purpose of entering or leaving the locks in still water; provided the extension and form thereof shall be such as shall not prevent the convenient passage of boats and lumber down the river, nor obstruct the passage of fish."

With the completion of these canals the Connecticut River entered upon its period of greatest commercial activity. From Hartford, Conn., to Wells River, Vt., the whole river was open to navigation. Freights were carried in flatboats,

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built for the most part 70 feet long, 15 feet wide, and with a carrying capacity of from 30 to 40 tons. Through interior New England from Vermont to the sea over this great open roadway came a vigorous prosperity to the towns and cities of the Connecticut valley.

The application of steam to the problem of transportation, the invention of the steamboat and the steam engine sounded the doom of commercial activity on this river above Hartford. Although the advent of steamboats upon the river was enthusiastically welcomed, failure followed upon failure in their use. Not only were the boats too large to pass through the locks and canals provided for the flatboats, but they were of too great draft to allow of safe navigation in the upper river. After various experiments a system of relay steamers was adopted, plying between the locks and canals somewhat after the fashion of the early flatboats. The loading and unloading of the freights, causing undue delay and increased expense, proved disastrous, and after two years the scheme was abandoned.

Neither comprehensive plans for adequate canal and river improvement nor enthusiasm for their achievement were lacking in this valley, but the first railroad had already secured its charter. Within 10 years the new means of transportation had so extended its system that competition seemed hopeless. The locks and canals were abandoned for traffic, and above Hartford the great river was practically closed to commerce.

With the coming of the railroads, interest in the development of inland waterways was destroyed. The immediate commercial and financial returns of the railroads proved an irresistible lure. A kind of national stampede took place away from waterway development toward railroad construction. Schemes for the improvement of inland waterways were dismissed, half-completed projects were abandoned.

At the present time the river up to Hartford is principally used by the steamers and barges of the Hartford Transportation Co., owned or controlled by the New York, New Haven & Hartford Railroad Co. From Hartford to Springfield and Holyoke very little use is made of the river, and that is practically confined to launches and small craft generally, although some coal has been carried to Springfield by the pioneers in this line, the Springfield Navigation Co., by means of small barges which could pass through the restricted locks and canal at Windsor Locks in Connecticut. It is well known, however, that this company is very much interested in procuring increased facilities for navigation, and is prepared to build additional barges for the transportaton of coal to Springfield as soon as conditions will warrant. A small steamer plies during the summer season between Springfield and a recreation ground down the river about 6 miles. Upstream as far as the rapids below the Holyoke Dam considerable use of the river is made by motor boats and a steamer, but for commercial purposes very little use is made.

There is no navigation, except by small boats for pleasure purposes, above Holyoke as far as Turners Falls, and above Turners Falls to the State line, although there are possibilities for a large and highly profitable use of the river for commercial purposes all the way from the present head of navigation at Holyoke to and into New Hampshire and Vermont territory. Continuous and unobstructed navigation would require the restoration, with amplified dimensions and depths, and with suitable locks, of those canals which were provided in the early days of navigation on the river for passage around the rapids and falls, and which, most unfortunately, it seems to this board, were allowed to be closed and abandoned.

The river as far down as Mount Tom Station is used for floating logs. This business is carried on by the Connecticut Valley Lumber Co., which has built at various places booms and other protective structures. Those built since 1898 have been licensed by the board of harbor and land commissioners, the jurisdiction of that board having been extended to this class of structures and encroachments on this river by chapter 498 of the acts of 1898. The enactment of that statute made it possible to protect the boating interests, and this company, as well as other parties using this public waterway, have been heard and matters in dispute adjusted from time to time without resorting to the courts.

In addition to the licensing of booms, the board of harbor and land commissioners has approved many plans for building bridges, landings, and other structures at various points.

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INVESTIGATIONS, REPORTS, APPROPRIATIONS, AND EXPENDITURES BY THE COMMONWEALTH OF MASSACHUSETTS.

The total length of the Connecticut River within the State of Massachusetts, measured as the river flows, is 66.57 miles, of which 50.7 miles is above the Holyoke Dam and 15.87 miles below this dam.

The following table shows the distances between various points along the entire length of the river in Massachusetts and Connecticut, beginning opposite the light at the outer end of the west jetty at the mouth of the river at Saybrook:

	Miles.
Light at west jetty, Saybrook, Conn	0.0
Railroad bridge at Connecticut River station	3.31
Lyme and Saybrook Bridge	3.95
East Haddam Bridge	15.47
Railroad bridge at Middletown	29.99
Highway bridge at Middletown	30.18
Highway bridge at Hartford	48.39
Railroad bridge at Hartford	49.08
Bridge at Windsor Locks	60.13
Railroad bridge above Windsor Locks	61.24
Bridge below Enfield Dam	63.48
Enfield Dam	64.46
Thompsonville Bridge	65.18
Massachusetts-Connecticut line	66.83
South End bridge, Springfield	71.28
Old Toll bridge	72.68
Boston & Albany Railroad bridge	72.82
North End bridge	73.71
Chicopee Bridge	76.33
Willimansett Bridge	80.78
Boston & Maine Railroad bridge	80.81
South Hadley Bridge	82.32
Holyoke Dam	82.70
Northampton Bridge	93.88
Railroad bridge at Northampton	93.91
Sunderland Bridge	106.69
Boston & Maine Railroad bridge at East Deerfield	113.95
New York, New Haven & Hartford Railroad bridge at Montague City	115.59
Montague City Bridge	115.97
White suspension bridge	118.51
Dam at Turners Falls	119.16
Red suspension bridge	119.41
Mount Hermon Bridge	130.14
Central Vermont Railroad bridge, Northfield	131.85
Schell Memorial bridge, Northfield	132.39
Massachusetts-New Hampshire-Vermont line	133.40

Nineteen cities and towns bordering on this river in Massachusetts have a total frontage thereon of 134.05 miles, of which about 14,875 feet, or 2.82 miles, are owned or controlled by the municipalities, and 24,274 feet, or 4.59 miles, by railroad companies.

A table giving detailed information follows:

Ownership or control.

Town or city.	By municipality.	By railroads.	Private.	Total.	Total frontage.
	Feet.	*Feet.*	*Feet.*	*Feet.*	*Miles*
Agawam			24,583	24,583	4.65
West Springfield	3,680	900	26,670	31,250	5.90
Longmeadow			17,916	17,916	3.39
Springfield	1,800	14,609	8,174	24,583	4.65
Chicopee	55	3,925	33,520	37,500	7.10
Holyoke	2,060		56,440	58,500	11.08
South Hadley	(1)		34,833	34,833	6.59
Easthampton			1,666	1,666	.31

[1] Ferry landing.

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Ownership or control—Continued.

Town or city.	By municipality.	By railroads.	Private.	Total.	Total frontage.
	Feet.	*Feet.*	*Feet.*	*Feet.*	*Miles.*
Northampton	1,900	3,000	30,983	35,833	6.78
Hadley	(1)	.....	80,333	80,333	15.20
Hatfield	(1)	.....	41,250	41,250	7.80
Whately	.....	.....	16,250	16,250	3.08
Sunderland	(1)	.....	34,166	34,166	6.46
Deerfield	(1)	.....	48,750	48,750	9.22
Greenfield	5,280	.....	12,636	17,916	3.39
Montague	.....	1,840	68,992	70,832	13.40
Erving	.....	.....	2,918	2,918	.55
Gill	(1)	.....	53,750	53,750	10.18
Northfield	100	.....	75,016	75,016	14.22
Total for 19 cities and towns	14,875±	24,274	669,296	708,445	134.05

[1] Ferry landing.

Mr. Clemens Herschel, at that time hydraulic engineer for the Holyoke Water Power Co., stated in a paper prepared for the harbor and land commissioners in 1884 that in a length of about 59 miles, in Massachusetts, the river had a fall of about 155 feet.

The river from Willimansett Bridge at Holyoke to the boundary line between Massachusetts and Connecticut, and extending to the Enfield Dam in Connecticut, was a mill pond about 16 miles long, formed by this dam. Rapids covering a fall of about 27 feet existed from Willimansett Bridge upstream to the foot of the Holyoke Dam, the fall at this dam being about 30 feet.

Below Smiths Ferry, about halfway between Northampton and Holyoke, were rapids; and rapids and a dam at Turners Falls 36½ miles from the Holyoke Dam, covered a fall of some 66 feet in all. Above Turners Falls the mill pond extended some 4 or 5 miles upstream to the junction with Millers River, then came rapids of some 10-feet fall. The river left the State at its northern boundary at an elevation of about 195 feet above the mean level of the sea.

Topographical surveys from a point about 1 mile below the Holyoke Dam to the northerly boundary line of Massachusetts have been made under the direction of the board of harbor and land commissioners, and maps prepared showing the river lines, various bridges and other structures, and the topographical features along the banks. These data have been used in preparing the maps accompanying this report. Owing to lack of funds the Connecticut Valley Waterway Board has been unable to supplement this work by making soundings in this part of the river and procuring other data necessary to the preparation of any project for future improvement for purposes of general navigation. For the same reason no surveys could be made of other parts of the river.

From inquiry and from information furnished by F. W. Carrier, who has navigated this river for many years and is familiar with the subject, it appears that conditions in respect to depths of water as far as Turners Falls are substantially as follows:

From a point at the rapids 2 miles above the Holyoke Dam to Mount Tom Station there is always a depth of not less than 6 feet.

From Mount Tom Station to Shepards Island, during periods of normal water level, there is from 3.8 feet to 6 feet.

From Shepards Island to a point one-half mile above the Horseshoe, commonly called Bowmans Pool, 2 miles above Northampton Bridge, there is always a depth of from 4 feet to 40 feet.

From Bowmans Pool to the head of the riprapping at Hadley there is a depth of from 3 feet to 8 feet during periods of normal water level.

From the riprapping to the cable crossing, or the old ferry road, during periods of normal water level there is not more than 3 feet.

From the cable crossing to Indian Hill, or Ryans Gravel, there is always 8 feet or a little more.

From Ryans Gravel to the Hadley-Sunderland line there is a depth of 2½ feet at periods of normal water level.

From the Hadley-Sunderland line to the southerly end of the second island above Sunderland Bridge there is always at least 4 feet.

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From this last point to Whitmores Ferry, with the exception of a short stretch at the head of this island, there is a depth of 3 to 4 feet or more at periods of normal water level.

From Whitmores Ferry to a point opposite the southerly end of an island, just south of the mouth of Sawmill River, there is a depth of from 8 to 10 feet at all times.

From the last-named point for a distance of about 6,700 feet there are shifting sands, rocks, and snags, and the river is in general full of shoals.

From the last-named point to the Boston & Maine Railroad bridge, Fitchburg division, at East Deerfield, there is a depth of from 5 to 10 feet.

From this bridge to the south end of an island, about 4,300 feet, there is, at periods of normal water level, a depth of 3½ feet, there being at the southerly end of this island a large number of rocks extending across the river.

From this last-named point to a point 600 feet below the New York, New Haven & Hartford Railroad bridge at Montague City there is from 4 to 10 feet, and below this bridge are a large number of rocks extending nearly across the river.

From this last point to the junction of the Connecticut and Deerfield Rivers, and as far north as Montague City Bridge, there is a depth of from 10 to 30 feet.

From Montague City Bridge to Turners Falls Dam the depth of water varies, but the character of the river bottom is ledge practically all the way.

Above Turners Falls, for a distance of about 4.34 miles to the French King Rapids, there is much use made of the river by motor boats for pleasure purposes, and there is apparently a good depth of water, excepting at the "Horse Race," which is obstructed by outcropping ledge.

Although the State of Massachusetts has made no expenditure directly with a view to increasing the depth of water and improving the facilities for water carriage, yet, beginning in the year 1888, the Commonwealth has built protective works along the river banks at Hadley, Hatfield, Agawam, Northampton, and West Springfield, for which $103,508.17 was expended. The total expenditure to December 1, 1912, is $106,296.18.

By chapter 58 of the Resolves of 1884 the board of harbor and land commissioners was authorized "to examine the channel and course of the Connecticut River within the confines of this Commonwealth, and to investigate the cause and effects of floods upon the same, and to report to the next general court the necessity or expediency of any legislation for the preservation and improvement of said river, and for the promotion of all interests connected therewith."

The principal facts and suggestions submitted at public hearings given by the board in pursuance of this resolve were as follows:

1. That the channels, banks, and course of the river are continually changing, in some places rapidly, and to the serious detriment of public as well as private interests. No accurate record of these changes exists, and the observation or memory of individuals in regard to them is conflicting and unreliable.

2. That artificial structures have been built from time to time in or across the river for business uses, and may be required in the future, especially by the lumbering interest; and that, while there is no feeling of hostility toward this or any other interest using the river, but, on the contrary, a disposition to allow every necessary and reasonable facility in its use, there is some apprehension in regard to the actual or probable effect of some of these structures upon other interests, public or private, and a feeling that the location, mode of construction, and maintenance of all artificial structures within the bed and banks of the river should be subject to some system of public regulation and control analogous to that which supervises the building of railroads or the erection of structures in tide waters.

3. That there has never been any uniform plan or system governing the construction of the various improvements, defensive works, dikes, or levees, breakwaters, booms, piers, etc., in or adjacent to the river, with reference to their influence upon the flow of the river and its action upon its bed and banks, that the attempts to restrain the ravages of the river by protecting works have, with few exceptions, been disjointed, ill advised, and unsuccessful, and that an approved general system, based upon principles and rules which are the result of scientific investigation and study, is needed to guide the construction and prevent the injurious effects of all such structures and works and to secure the concerted and successful action of all the different interests for their common benefit and protection.

4. That the floods to which the river is subject expose a large territory and large interests to serious damage; that many observers believe that the currents

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of the river, by reason of the increase of artificial obstructions or from other causes, do not remove deposits as rapidly as formerly, and that the channels are "silting up," the bed becoming higher and more shallow, and the dangers from floods in consequence aggravated; that long and severe droughts are also a source of much inconvenience and loss, and that the subject of the control of floods and droughts by storage basins or otherwise is now receiving much attention in this and other countries and is deserving of careful consideration and study in connection with this river.

5. That within a comparatively recent period large manufacturing interests have grown up at different points upon the river, that the dams of the water-power companies and the booms and piers of the lumber companies and the storage of logs have altered the natural flow and habit of the river and are tending to change its whole régime, and that these changes and their effects should be carefully observed and noted, so that injurious results may be seasonably averted.

6. That sufficient data do not now exist for prescribing the best methods for the preservation and improvement of the river and for "the promotion of all interests connected therewith," that as the first step toward determining a proper system of treatment, whether in general or in detail, a survey and plan of all that portion of the river within the Commonwealth should be made, accurate levels established at points along its banks, sufficient soundings taken to determine the location and depths of its channels, and such other physical facts and features noted as would enable competent experts to study and prescribe the best general system of treatment and to solve such practical questions as might from time to time arise, and that daily observations of the heights of the water at selected points should also be taken and recorded.

The word "conservation" was not very generally used 25 years ago, yet Massachusetts used and applied it to this river in chapter 344 of the acts of 1885, entitled "An act in relation to the conservation of the Connecticut River." This act conferred upon the board of harbor and land commissioners the general care and supervision of this river within the confines of the Commonwealth, and of the banks thereof, and of all structures therein, "in order to prevent and remove unauthorized encroachments and causes of every kind, which may in any way injure the said river, and in order to protect and develop the rights and property of the public therein."

Other parts of this act provide for the approval by the board of plans of certain structures in the river; the licensing of wharves, piers, etc.; the surveying and plotting, as soon as funds should be provided therefor, on such scales as they shall determine, the whole of the river within the Commonwealth, the records and maps of the same to be preserved in the office of the board; the preparation for the counties of Hampden, Hampshire, and Franklin of a copy of the survey or map of the river. The effect of this act was to give the board jurisdiction over this river, within the confines of the State, similar to that which it then had over tidewaters.

An appropriation of $1,000, made in 1896, for beginning surveys of the river, as contemplated in the act of 1885, is the only direct appropriation for this purpose which has been made. Under this appropriation about 6½ miles of the river were surveyed, based on the triangulation done under the direction of the topographical survey commission, whose powers and duties were transferred to the harbor and land commissioners in 1901.

On February 6, 1896, the Massachusetts Legislature adopted resolutions relative to the navigation of this river, urging the need of opening it to navigation as far as Springfield and Holyoke.

By chapter 82 of the resolves of 1897 the board of harbor and land commissioners was "authorized to inquire into the advantages which would accrue to this Commonwealth by the improvement of the navigation of the Connecticut River as far as the cities of Springfield and Holyoke."

Under authority of this resolve an exhaustive study of this matter was made, and a report to the legislature submitted under date of January, 1898. (H. Doc. No. 907, 1898.) The conclusions of the board were:

"1. That transportation by water should be established immediately as far up the river as Holyoke.

"2. That the prosperity of Massachusetts depends upon the encouragement of manufacturing in the interior and the development of commerce at the seaboard.

"3. That conditions here are favorable for the payment of high wages and production at low cost, and the tendency of these conditions would be elevating among the class of citizens who supply the skilled labor.

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"4. That low cost of transportation for raw material and fuel to the manufacturing centers and for the finished product to the markets are essential to success in competition.

"5. That the opening of water carriage to railway centers insures low freights.

"6. That the beneficial influence of the direct advantages would extend broadly in many directions, while the indirect influences would be too diversified and numerous to set forth, and yet would pervade the whole Commonwealth.

"7. That no reason exists which would justify Congress in denying to the inhabitants of the Connecticut Valley the benefits to be derived from improving the river navigation as desired, in accordance with the policy of internal river improvements, now settled for more than 70 years and generously applied in other portions of the country."

It may be well to call attention here to the fact that 25 years ago not only were the cities and towns in this valley, and the State as well, in accord with the movement for an improved waterway to Springfield and Holyoke, but Maj. Leach, of the Engineer Corps, had at that time submitted to the Chief of Engineers a report and plan favorable to such a project, as appears on pages 11 and 12 herein.

Certain other important legislation concerning the Connecticut River, passed by the Massachusetts Legislature, is noted in the following paragraphs:

Chapter 266 of the acts of 1891 provided that all work done in or within the banks of this river below high-water mark, without authority from the legislature or the board of harbor and land commissioners, or in a manner not sanctioned by said board when its license or approval is required, should be deemed a public nuisance and liable to indictment as such; and said board was authorized to order suits on behalf of the Commonwealth to prevent or stop any such nuisance, by injunction or otherwise. It is further provided that nothing in this act should be construed as legalizing any structure, filling, or other encroachment below high-water mark on said river, heretofore made or done without due authority of law, or as waiving or impairing any rights or remedies of the Commonwealth or of any person in respect thereto.

By chapter 301 of the acts of 1893 a river line was established along the banks of the river at Springfield to limit the extension of wharves, piers, walls, and filling or other structures, excepting that the city of Springfield might, upon license from the harbor and land commissioners, extend sewer outfalls beyond this line.

By chapter 104 of the resolves of 1898, $2,000 was appropriated for the purpose of securing favorable consideration by Congress of the opening of the river to navigation, to be expended under the direction of the governor and council to meet the necessary expenses of the harbor and land commissioners in appearing before the proper committees of Congress to present the advantages that would accrue to the Commonwealth by the restoration of such navigation.

Chapter 115 of the resolves of 1907 authorized the board of harbor and land commissioners to dredge a channel 6 feet deep at low water in the Connecticut River in the city of Holyoke, and authorized the expenditure of not exceeding $15,000 for this purpose. A provision in this resolve was that no part of said sum should be expended until the United States had begun to improve the channel and locks in said river in order that vessels with a draft of not less than 6 feet might freely pass from the sea to the entrance of said proposed channel near Willimansett Bridge. No expenditure for the purposes authorized by this resolve has been made.

Chapter 573 of the Acts of 1908 provided that no wharf or other structure shall ever hereafter be built or extended in the Connecticut River at Springfield beyond the river line described in chapter 301 of the acts of 1893 without the permission of the board of harbor and land commissioners, this act repealing a part of said chapter 301 of the acts of 1893.

TERMINAL FACILITIES.

The resolve under which this board is acting provides that its report shall contain data concerning terminals, the development and utilization of water power, and other facts pertaining to the subject-matter of this inquiry.

The facts concerning terminal facilities noted on page 20 [1] of this report, and as reported on by the United States engineer officer in 1910, cover practically the situation to-day; that is, existing terminal facilities are in a measure adequate for the present needs.

[1] Page 20 (not printed) of report referred to, i. e., the report of Connecticut Valley Waterway Board.

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For handling the business that ought to follow the complete opening of the river to steamers and barges which now pass through Long Island Sound and into the harbors thereon, as well as to New Bedford, Newport, Providence, Fall River, and as far as Boston, terminal facilities should be arranged for now by the municipalities bordering on the river, so that there may be shown to Congress that there is not only a willingness but a practical certainty that the people of the Connecticut Valley will now, as they have been willing to do for many years, cooperate with the Federal Government to the fullest extent in providing proper terminals, with rail connections and such appliances for handling freight and passengers as may be required. The board is satisfied, from replies and other information received from some of the larger municipalities on the Connecticut, that they will acquire, if it is not already owned, the necessary land, and build thereon piers, wharves, and docks, to be publicly equipped and owned.

The precise location and dimensions of such terminal facilities can be determined only after a more extended study of this subject than this board has been able to make within the time allowed, and depends to a certain extent upon the decision of the Government in respect to location, width, and depth of any projected channel which may be provided in the vicinity of the water front of the various cities and towns.

On March 10, 1913, the railroad commissioners filed with the Hampden County superior court a plan relating to the improvement of the river front of Springfield, under the provisions of chapter 551 of the acts of 1907 and chapter 352 of the acts of 1910. This plan, however, or any plan, before the same can be carried into effect under these statutes, is obliged to receive the approval of the city of Springfield and the railroad companies.

The policy of the Commonwealth has been to appropriate and use public funds, as well as the income of certain funds, in aid of and in extension of the work of river and harbor improvements by the General Government—probably to a larger extent here than in any other State in the Union—and there can be no possible reason why this policy should not be continued in favor of those great and important rivers—the Taunton, Merrimac, and Connecticut.

WATER POWER.

Chapter 359 of the acts of 1909 provided for an investigation of the water power of the Commonwealth and for determining the best method of utilizing the same. Section 1 authorized the expenditure of $5,000, and section 2 empowered the governor of Massachusetts to enter into a contract with the Director of the United States Geological Survey for the purpose of making these investigations. It was provided "that said director shall agree to expend a like sum of money within the Commonwealth for the same purposes;" a further provision was "that if said director should find that by reason of the failure of Congress of the United States to provide a general appropriation sufficient to enable him to make an allotment of five thousand dollars for such work in this Commonwealth the governor may execute a contract for any part of the amount hereby appropriated, which part shall be equal to that allotted by the director."

Chapter 622 of the acts of 1911 provided for the completion of the investigations authorized by the act of 1909, and the expenditure of the unexpended part of the appropriation made in 1909. Section 3 provided that "A brief report of the work done under the provisions of this act shall be made to the governor by the Director of the United States Geological Survey on the first day of January, nineteen hundred and twelve, and a final report shall be made by said director to the governor on or before the first day of January, nineteen hundred and thirteen, embodying the complete results of the investigation."

Chapter 564 of the acts of 1912 provided that $3,000, or such portion thereof as may be necessary, might be expended annually for the purpose of continuing these investigations for a period of five years, and the governor was empowered to enter into a cooperative agreement with the Director of the United States Geological Survey for the purpose of making the necessary investigations. Section 4 of this act provided that a complete report of the work done under this act should be made to the governor by the Director of the United States Geological Survey on January 1 of each year in which cooperative work should have been maintained under the authority of this act.

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In accordance with the cooperative agreements entered into between the State of Massachusetts and the United States Geological Survey, under authority of the acts above cited, progress reports have, from time to time, been made by the Federal Government to the executive of the Commonwealth, which cover, among other localities in Massachusetts, portions of the Connecticut River and its principal tributaries. These reports,[1] however, are very general in character, dealing principally with a general description of certain drainage basins and the installation and maintenance of recording gauges, etc.

The progress report of December 30, 1910, says:

"With the increased population, the continued industrial development, and the resultant demand for power, the water supply of the State becomes more and more valuable. While there is considerable data pertaining to the water supply of Massachusetts, it has been gathered largely by private interests and not all of it is available for public use. The courts are continually called upon to adjust damages and benefits and it is the moral duty of the State to provide reliable records upon which her courts may make equitable decisions, as well as to furnish basic data for water-power developments. * * *

"The natural facilities for storage on the Connecticut River are perhaps less than on many of the New England rivers, although on Millers, Chicopee, and Farmington Rivers some storage has been developed. There are, however, many locations in this basin where reservoirs could be constructed, and there is much need of systematic effort in this direction, as the low-water flow on the Connecticut could be much improved by utilizing some of these opportunities for storage."

The Connecticut Valley Waterway Board has been unable, owing to lack of time and the necessary funds, to make such investigations of the subject of water power and water-power development as it desired, but submits herewith such information as it has been able to gather covering such development at Holyoke and other places on the Connecticut River and some of its tributaries.

The Holyoke dam[2]—The proprietors of locks and canals on Connecticut River, under charter granted in 1792, built a dam and canals at South Hadley to enable boats to pass the falls at that point. These navigation works were on the easterly shore of the river and opposite the present city of Holyoke.

After some years of prosperity the profits of the proprietors declined, owing to railroad competition, and in 1848 the stock was acquired by the Hadley Falls Co. This company proceeded to plan works for the purpose of utilizing the water power available at this point. Chapter 30 of the acts of 1884 confirmed a deed from the proprietors of the locks and canals on the Connecticut River to the Holyoke Water Power Co. and dissolved the first-named corporation.

The first dam built by the Hadley Falls Co. was a timber dam, temporary in character, constructed for the protection of a permanent one in process of building. This dam, completed in 1848, was so poorly constructed that when the gates were closed the rush of water carried away the greater part of the dam.

The second and permanent dam, more strongly constructed but also of timber, was finished in October, 1849. While this dam proved strong enough to withstand even extraordinary freshets, various repairs became necessary. By 1868 the constant fall of water had made depressions in the crest, while the passing of logs had pried out and broken the face timbers. The washing out of the ledge threatened to undermine the dam. To remedy these defects a large apron was built downstream from the dam at a cost of about $300,000. A few years later a new crest was built and the sloping faces of the dam and apron brought up to it.

In 1879 a whirlpool on the surface of the water above the crest of the dam caused an examination to be made, disclosing a break in the plank covering. Cribs were sunk to inclose this, and other holes were discovered.

After continued breaks in the following years, more thoroughgoing measures were taken in 1885. In this year 20 feet of the top surface was replanked, a row of piling at right angles to the slope placed inside, and the whole filled with gravel. These repairs remedied the leaking to a large extent, but the settlement of the dam continued.

In 1891 plans were begun for a new dam of stone, to be built further downstream. The body of this dam is built of rubble laid in Portland cement mortar.

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[1] See Water Supply Paper No. 281, United States Geological Survey.

[2] Summarized from paper prepared by Albert F. Sickman, hydraulic engineer, in Journal of the New England Water Works Association, Vol. XVIII, No. 4.

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The spillway, upper face, and 5 feet of the top are of heavy granite blocks, the lower blocks fastened with galvanized iron dogs, the top ones with iron dowels. The toe of the dam is protected from erosion and undermining by a heavy bed of rubble masonry, the greater part covered with concrete. The dam was five years in building.

A system of distributing canals, laid out on the nearly level plain inclosed by the bend of the river, consists of three levels.

The water power[1] generated at this dam is distributed to the mill corporations under a form of perpetual lease, recorded like a deed in the registry of deeds. This lease grants the land necessary for the buildings desired as an adjunct to the grant of water power, the price paid being based not upon the amount of land granted, but upon the amount of water power used. The usual form of payment is that of a fixed amount called a bonus, and an additional annual rental.

The power company regulates the amount taken by the mill corporations, making its own inspections and measures at the property of the grantees.

The grantors must keep in repair the canals, and must forever maintain the dam. The grantees keep in condition the flumes and raceways, and pay a perpetual annual rent.

By chapter 152 of the acts of 1909 the Holyoke Water Power Co. was authorized to make, manufacture, and sell electricity for power purposes and lighting.

This company owns a large frontage on the west bank of the Connecticut River.

Turners Falls Dam.—On February 23, 1792, a law was passed incorporating the Proprietors of Locks and Canals on Connecticut River—"John Worthington, Esq., and others, for the purpose of rendering Connecticut River passable for boats and other things from the mouth of Chickapee River northward throughout this Commonwealth." By terms of this act the Proprietors were to erect and keep up locks and canals "between the mouth of the Chickapee River (so called) in Springfield, and the mouth of Stoney Brook (so called) in South Hadley, and between the mouth of Deerfield River (so called) and the head of Millers Falls (so called) in Connecticut River."

An act of February 27, 1794, authorized the separation of the Proprietors into two companies, one to be called the Proprietors of the Upper Locks and Canals on Connecticut River in the county of Hampshire, and to retain control, rights and privileges of the former company "between the mouth of Deerfield River and the head of Millers Falls."

By chapter 122 of the acts of 1854 the Proprietors of the Upper Locks and Canals on Connecticut River, in the county of Hampshire were authorized to maintain and use their dams, locks, and canals, and to construct other dams, locks, and canals for the purpose of creating water power to use or sell.

By this act and by chapter 150 of the acts of 1862 the Proprietors were relieved of all responsibility to support locks, dams, and canals for purposes of navigation, to keep such locks and canals in repair or to maintain the same as a navigable highway.

By chapter 275 of the acts of 1866 the name of the Proprietors of the Upper Locks and Canals on Connecticut River in the county of Hampshire was changed to the Turners Falls Co.

By chapter 148 of the acts of 1880 the Turners Falls Co. was authorized to construct dams, locks, and canals, and was relieved "from the obligation to support its locks, dams, and canals for the purposes of navigation, and its said canal is hereby discontinued as a navigable highway."

The first dam built at Turners Falls was under the original charter and was for the purposes of navigation.

In 1866 the Turners Falls Co. built a dam with a height of 30 feet and a length of 1,000 feet. The length was in two sections, and the center was supported upon an island near the center of the river.

In 1904 the canal was widened from 50 feet to 150 feet, and increased in length.

During 1912 the erection of a new concrete dam was begun, also the widening and deepening of the canal. The canal will finally be extended to a point below the natural "rock dam" near Montague City, where a fall of 60 feet will produce electrical energy equal to 40,000 horsepower.

By chapter 197 of the acts of 1913, the Turners Falls Co. was authorized to raise the height of its present dam or to build a new dam in place thereof.

[1] 40,522 horsepower, report of United States Commissioner of Corporations, March, 1912.

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The Turners Falls Co. supplies to allied companies water power for mechanical and lighting purposes. The most important of the companies are the Amherst Power Co., Greenfield Electric Light & Power Co., Amherst Gas Co., Easthampton Gas Co., and Franklin Electric Co.

It is expected that the improvements now in progress will result in the development of a total of 47,000 horsepower.

The Turners Falls Co. owns a large frontage on the Connecticut River in the town of Erving.

French King Rapids.—By chapter 580 of the acts of 1908 the French King Rapids Power Co. was incorporated and authorized to construct a dam on the Connecticut River between a point in the town of Gill, on the west side of the river, and some point or points in the town of Northfield or the town of Erving, on the east side of the river, with the necessary power houses, etc., subject to the provisions of chapters 96 and 196 of the revised laws.

The foot of these rapids is about 4.34 miles above the dam of the Turners Falls Co. The rapids extend up the river about one-half mile.

On May 1, 1912, plans for construction and maintenance of a dam, with power houses, retaining walls, and appurtenances, as authorized by the act aforesaid, submitted by this company, were approved by the board of harbor and land commissioners, a condition in the written approval being that said company when constructing said dam shall provide a derrick or other suitable means for hoisting over said dam boats or canoes of 25 feet or less in length. No work under this authority has been done.

Water power on Millers River.—The main stream may be regarded as formed in the town of Winchendon, in northern Worcester County, Mass., by the union of branches from the town of Ashburnham, and from Lake Monomac, the latter on the New Hampshire boundary. The river then pursues an irregular westerly course for about 32 miles, passing into Franklin County, joining the Connecticut a little way above Turners Falls. In its upper course it receives Otter River from the south and Tilly River from the north, and those are its principal tributaries, although it is joined by numerous other minor streams. Its drainage area comprises 396 square miles, a small portion of which lies in New Hampshire. Although not a very large stream, Millers River is a valuable one for milling purposes on account of its uniform and well-sustained volume. It is quite in contrast to the Deerfield River in this respect, as well as in the character of its valley, which is much more open in general and better suited to settlement. The fall is also large, amounting in round numbers to 600 feet from Royalston to the mouth, a distance of 23 or 24 miles.

Some 30 individuals and corporations own, control, or use an aggregate of about 7,300 horsepower.

Legislation is now pending for the incorporation of the Millers River Improvement Co., with authority to improve the usefulness of this river and its tributaries and to maintain reservoirs and dams. The board is informed that if the projected developments are carried out, the present horsepower will be largely increased and will amount to between 40,000 and 50,000.

CONNECTICUT RIVER POWER CO. AND NEW ENGLAND POWER CO.

The board is indebted to Mr. H. S. Harriman for the following information concerning the various power plants controlled by the Connecticut River Power Co. and the New England Power Co.:

"The plant on the Connecticut River owned by the Connecticut River Power Co. is located between Vernon, Vt., and Hinsdale, N. H., about 5 miles north of the Massachusetts line. The plant consists of a dam 650 feet long and approximately 30 feet high above the average water level of the river. The power station is located on the end of the dam, contains 8 generators of 2,500 kilowatts capacity each, or a total of 20,000 kilowatts.

"At the present time the New England Power Co. is constructing four plants on the Deerfield River. Three of these plants are located near Shelburne Falls, and each plant has approximately 63 feet of head. Each power station contains three 2,000-kilowatt units, giving a total capacity for the three plants of about 18,000 kilowatts. The fourth plant is located about 2 miles north of Hoosac Tunnel, and when completed will operate under approximately 200 feet of head. This plant will contain units having a capacity of approximatly 12,000 kilowatts. In addition to the above four power plants, the New England Power Co. is building a very large storage reservoir in the upper waters of the Deerfield River in the town of Somerset. This reservoir is created by a dam 100 feet high,

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flooding approximately 2,000 acres and having a capacity of approximately 2,700,000,000 cubic feet. This reservoir will very greatly equalize the flow of the Deerfield River and will enable the power company to deliver a much larger amount of constant power than would be the case were we dependent merely upon the natural flow of the river."

All of the above plants on the Connecticut and Deerfield Rivers are connected by transmission lines owned by the Connecticut River Transmission Co.

The New England Power Co. owns approximately 1,000 feet of fall on the Deerfield River. Its present developments utilize a little under 400 feet, and the remaining 600 feet will be developed as rapidly as market conditions warrant.

STATISTICS.

The board has given much time and attention to the gathering of statistics relating to population, valuation, value of raw material, value of product and amount of tonnage, and data covering various industries carried on in the Connecticut River Valley, and has compared the same with statistics and data heretofore published for the purpose of showing that the increased industrial growth justifies any reasonable expenditure to secure river navigation which will greatly decrease the cost of transportation of commodities, and thereby benefit the industries of this district. The board has received valuable assistance in this work from the director of the Massachusetts bureau of statistics and from boards of trade, corporations, and individuals.

In 1895 Springfield, Holyoke, Chicopee, and West Springfield covered an area of about 93 square miles, their population being 114,389, and the assessed valuation $103,393,020. The combined total value of goods made was about $47,000,000.

In 1911 the same communities, while covering approximately the same area as in 1895, had a population of 181,281, as given in the United States census, 1910, this being an increase of over 50 per cent. In 1912 the assessed valuation of these communities aggregated $230,581,374, an increase of more than 120 per cent over the valuation in 1895. In 1911 the combined total value of goods made in these communities was $99,489,139, an increase of more than 100 per cent since 1895.

The value of stock and materials now used in these communities is approximately 100 per cent greater than in 1895. Statistics in detail as to the value of stock used and of goods made in the year 1895, in Springfield, Holyoke, Chicopee, and West Springfield, are given as follows in the State census of 1895:

	Value of stock and material used.	Value of goods made.
Chicopee	$2,983,115	$6,667,68
Holyoke	12,255,556	22,781,22
Springfield	8,436,384	16,569,22
West Springfield	920,357	1,365,41
Total	24,550,412	47,383,53

Between 1895 and 1911 the industries of the Connecticut River Valley increased to a remarkable extent, as is shown by the following table for the year 1911, compiled from information furnished by courtesy of the director of the Massachusetts bureau of statistics:—

	Value of stock and material used, 1911.	Value of product, 1911.
Springfield	$15,076,563	$32,607,08
Holyoke	24,674,515	42,898,08
Chicopee	12,462,961	19,979,70
West Springfield	1,999,727	4,014,28
Total	54,213,766	99,489,13

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The board of harbor and land commissioners, in its report (H. Doc. No. 907, 1898), said:

"The most important single commodity from the freight payer's standpoint is coal, and for this the figures are quite complete.

"From reports made by brokers, dealers, and large consumers who buy direct from mines, it is stated that the annual coal consumption of Springfield, Holyoke, Chicopee, and West Springfield is 447,000 tons. This does not include the coal consumed by the railroads, which is probably as much more."

The consumption of coal in Springfield, Holyoke, Agawam, Chicopee, Longmeadow, Ludlow, and West Springfield for the year ending December 31, 1912, was:

	Tons.
Springfield	716,708
Holyoke	477,720
Agawam	14,303
Chicopee	119,523
Longmeadow	3,252
Ludlow	14,944
West Springfield	40,972
Total	1,387,417

It was estimated in 1897 that the output of the Holyoke paper mills was about 90,000 tons. For the year ending December 31, 1912, the output of the various mills in Holyoke totaled in excess of 112,600 tons, an increase of over 25 per cent.

In Holyoke and Chicopee it was estimated in 1897 that there were 20,000 tons of raw material used by the cotton mills. This industry has increased to a large extent, as there was received during the year ending December 31, 1912, 63,123 tons of raw material, an increase of over 200 per cent. This material was valued at $15,997,400 and was used in producing finished products valued at $24,975,488.

In 1897 the total freight tonnage of Springfield, Holyoke, Chicopee, and West Springfield was given as 1,760,760 tons, both received and forwarded.

The total freight tonnage for the year ending December 31, 1912, was 2,977,900 tons, representing an increase of about 68 per cent. The amounts and places for the year 1912, by courtesy of the New York, New Haven & Hartford Railroad Co. and the Boston & Albany Railroad Co., are shown as follows:

Total freight tonnage for year ending Dec. 31, 1912.

Railroads.	Received.	Forwarded.	Total.
SPRINGFIELD.			
Boston & Albany	473,550	78,583	552,133
New York, New Haven & Hartford	490,381	101,263	591,644
Boston & Maine	187,535	85,970	273,505
Central New England	2,184	7,249	9,433
Total	1,153,650	273,065	1,426,715
HOLYOKE.			
Boston & Maine	445,414	162,108	607,522
New York, New Haven & Hartford	405,872	101,552	507,424
Total	851,286	263,660	1,114,946
CHICOPEE.			
Boston & Maine	78,952	17,287	96,239
WEST SPRINGFIELD.			
Boston & Albany (New York Central & Hudson River R. R. Co., lessee)	339,000	1,000	340,000

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Total freight tonnage in 1897 and 1912.

	Received.		Forwarded.		Total.	
	1897	1912	1897	1912	1897	1912
Springfield	738,706	1,153,650	323,313	273,065	1,062,019	1,426,715
Holyoke	441,479	851,286	144,926	263,660	586,405	1,114,946
Chicopee	40,157	78,952	11,495	17,287	51,652	96,239
West Springfield	36,652	[1] 339,000	24,132	1,000	60,694	340,000
Total	1,255,994	2,422,888	503,866	555,012	1,760,769	2,977,900

[1] Of the 339,000 tons received at West Springfield 324,000 tons was "company freight," of which approximately 280,000 tons was coal, a large part of which was used on locomotives running out of West Springfield.

Statistics [1] of manufacturers for the year 1911 are as follows:

Industries.	Number of establishments.	Capital invested.	Value of stock and material used.	Value of product.
Springfield:				
Total	251	$30,961,012	$15,076,568	$23,607,059
Automobiles, including bodies and parts	8	2,972,594	686,833	2,689,851
Brass castings, and brass finishings	5	151,761	167,809	278,263
Bread and other bakery products	18	225,521	486,557	894,214
Carriages and wagons	5	105,881	65,014	165,734
Electric machinery, apparatus, and supplies	5	501,927	105,019	273,127
Foundry and machine-shop products	27	4,695,273	846,028	2,667,066
Gold and silver, leaf and foil	3	17,630	32,325	48,960
Hardware	4	327,728	121,957	393,806
Hosiery and knit goods	4	708,850	348,280	659,744
Lithographing	3	784,964	166,823	525,404
Lumber, planing-mill products	7	267,444	307,146	489,288
Mineral and soda waters	5	37,632	24,724	58,125
Models and patterns, not including paper patterns	4	10,828	4,091	29,962
Paper goods, not elsewhere specified	7	935,278	602,659	1,118,706
Plumbers' supplies	4	283,728	109,308	201,268
Printing and publishing, book and job	7	1,655,052	493,351	1,553,196
Structural ironwork	4	38,898	38,073	77,243
Tobacco, cigars, and cigarettes	23	299,800	273,837	772,294
Waste	3	278,704	870,790	1,019,728
Other industries	105	16,561,429	9,326,939	18,701,068
West Springfield	10	4,403,792	1,999,727	4,014,291
Holyoke:				
Total	132	41,877,098	24,674,515	42,898,084
Bookbinding and blank-book making	4	991,607	664,429	1,323,355
Bread and other bakery products	17	127,134	241,431	399,731
Foundry and machine-shop products	14	2,692,782	844,560	2,010,179
Lumber, planing-mill products	4	298,028	406,140	700,556
Paper and wood pulp	22	13,542,941	8,304,962	13,626,845
Paper goods not elsewhere specified	3	763,353	924,030	1,301,568
Sausage, not made in slaughtering and meat-packing establishments	3	24,620	22,140	35,466
Stationery goods not elsewhere specified	6	959,924	751,569	1,440,894
Tobacco, cigars, and cigarettes	14	54,151	44,229	121,017
Other industries	45	22,422,558	12,469,025	21,928,483
Chicopee:				
Total	42	18,317,118	12,462,961	19,979,705
Bread and other bakery products	7	52,642	65,727	121,456
Brick and tile	4	120,200	21,551	77,500
Other industries	31	18,144,276	12,375,683	19,780,749
Northampton:				
Total	50	15,607,096	3,662,077	7,564,461
Bread and other bakery products	8	68,414	111,312	194,941
Cutlery and edge tools	3	469,055	129,771	535,742
Tobacco, cigars, and cigarettes	1	15,477	12,917	33,461
Other industries	34	15,054,150	3,408,077	6,800,317

[1] By courtesy of the Director of the Massachusetts Bureau of Statistics.

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Industries.	Number of establishments.	Capital invested.	Value of stock and material used.	Value of product.
Agawam	3	436,879	205,224	628,011
Deerfield	7	218,057	177,065	356,667
Easthampton	18	5,758,278	5,284,687	9,008,744
Greenfield:				
Total	31	2,483,395	1,173,655	3,207,279
Bread and other bakery products	3	25,889	64,352	94,897
Foundry and machine-shop products	5	334,119	111,268	506,619
Tools not elsewhere specified	7	987,251	268,297	1,157,682
Other industries	16	1,086,136	729,738	1,448,061
Montague:				
Total	18	3,254,790	1,232,343	2,418,426
Bread and other bakery products	4	17,925	24,029	41,635
Paper and wood pulp	3	2,474,221	950,699	1,656,819
Other industries	11	762,644	257,615	719,972
South Hadley	9	1,503,003	735,177	1,301,849

As has been stated, there was 1,387,417 tons of coal, including hard and soft, consumed in Holyoke, Springfield, and surrounding territory during the year 1912. While it is difficult to arrive at any very satisfactory figures for comparison between water and rail freight rates on coal, it is safe to assume that should the river be improved as far as Holyoke, and coal wharves and pockets at Springfield and Holyoke be provided, the result would be a saving to the consumer of not less than 80 cents per ton on coal carried to these places by river.

On other commodities, such as lumber, rubber, manure, pulp, cotton, paper, paper waste, rags, tobacco, sugar, etc., if the necessity for transshipment at Hartford is obviated, there would be a saving to the consumer of approximately from 10 to 15 per cent.

THE ENFIELD DAM AND RAPIDS AND THE SITUATION AT WINDSOR LOCKS.

During 1908 and 1909 there were introduced into Congress by the Enfield Power Co., the Northern Connecticut Power Co., and the Connecticut River Co., three bills for certain rights and privileges relating to the building of a dam and lock, and relocating the dam of the Connecticut River Co. across the Connecticut River at Windsor Locks in Connecticut, where a canal and locks, completed by the Connecticut River Co. about 1830, existed, and which had for many years been inadequate for use by any but small water craft.

In February, 1912, a hearing was held on these bills before a subcommittee of the Committee on Commerce of the Senate, at Washington. Representatives of the rivers, harbors, and bridges commission of Connecticut appeared before this subcommittee and urged the passage of an act which would permit the building of structures and the improvement of the river for navigation purposes above Hartford, and restore navigation to Springfield and other places. Subsequently the stockholders of the Connecticut River Co. relinquished, by vote, their right to charge tolls, and in October, 1912, public announcement was made that the Connecticut River Co. and the Northern Connecticut Power Co. had reached an agreement, and that the controversy had been settled, leaving the way clear for power development on a large scale, of approximately 30,000 horsepower, and the development of the river after favorable action by Congress.

The active cooperation of the Connecticut rivers, harbors, and bridges commission with this board in matters concerning navigation as far as Holyoke has been alluded to elsewhere in this report, and it was exceptionally helpful at a conference of the members of the two boards in November last, when the provisions of a bill to be presented by the Connecticut River Co. to Congress were discussed.

The members of the Connecticut Valley waterway board, in December, conferred with the acting chief of engineers, United States Army, in Washington, on the subject matter and certain provisions of the bill prepared by the Connecticut River Co., and subsequently appeared before the Committee on

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Commerce of the Senate, and were heard in favor of the bill. During its recent investigations at Washington the board was greatly assisted by the effective aid and cooperation of Hon. George P. Lawrence, Member of the House of Representatives, and by the two United States Senators from Massachusetts.

Following the hearing before the Committee on Commerce, there was introduced into the Senate of the United States on January 8, 1913, a bill "To authorize the Connecticut River Co. to relocate and construct a dam across the Connecticut River above the village of Windsor Locks, in the State of Connecticut," which was as follows:

"[S. 8033. 62d Cong., 3d sess.]

"*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That the assent of Congress is hereby given to the Connecticut River Company, a corporation organized and doing business under the laws of the State of Connecticut, to relocate its 'Enfield Dam,' so called, and to construct, maintain, and operate such relocated dam (which if located opposite Kings Island, in said river, shall extend across both branches of the river), together with works appurtenant and necessary thereto, across the Connecticut River at any point below a line crossing both branches of the river and Kings Island midway between the northerly and southerly ends of said island: *Provided*, That, except as may be otherwise specified in this act, the location, construction, maintenance, and operation of the structures herein authorized, and the exercise of the privileges hereby granted, shall be in accordance with the provisions of the act approved June twenty-third, nineteen hundred and ten, entitled 'An act to amend an act entitled "An act to regulate the construction of dams across navigable waters," approved June twenty-third, nineteen hundred and six': *And provided further*, That the time for completing said dam and appurtenances may be extended by the Secretary of War, in his discretion, two years beyond the time prescribed in the aforesaid act: *And provided further*, That the rights and privileges hereby granted may be assigned with the written authorization of the Secretary of War, or in pursuance of the decree of a court of competent jurisdiction, but not otherwise: *And provided further*, That the Secretary of War, as a part of the conditions and stipulations referred to in said act, may, in his discretion, impose a reasonable annual charge or return, to be paid by the said corporation or its assigns to the United States, the proceeds thereof to be used for the development of navigation on the Connecticut River and the waters connected therewith. In fixing such charge, if any, the Secretary of War shall take into consideration the existing rights and property of said corporation and the amounts spent and required to be spent by it in improving the navigation of said river, and no charge shall be imposed which shall be such as to deprive the said corporation of a reasonable return on the fair value of such dam and appurtenant works and property, allowing for the cost of construction, maintenance, and renewal, and for depreciation charges.

"SEC. 2. That the height to which said dam may be raised and maintained shall not be less than thirty-nine feet above zero on the Hartford gauge: *Provided*, That said corporation shall permit the continuous discharge past said dam of all water flowing in the Connecticut River whenever the discharge into the pool created by the dam hereby authorized is one thousand cubic feet per second or less, and at all greater discharges into said pool shall provide a mimimum discharge past said dam of not less than one thousand cubic feet per second: *And provided further*, That said corporation may, for not to exceed five hours between sunset and sunrise, limit the discharge past said dam to five hundred cubic feet per second whenever such limitation will not, in the opinion of the Secretary of War, interfere with navigation. The measure of water thus to be discharged shall include all the water discharged through the lock herein provided for and the present locks and canal of said corporation: *And provided further*, That nothing in this act shall in any way authorize said corporation at any time or by any means to raise the surface of the river at the location just above the present Enfield Dam to any height which shall raise the surface of the river at the lower tailrace of the Chemical Paper Company in Holyoke, Massachusetts, higher than can result from the erection or maintenance of any dam or dams which said corporation is authorized to erect or maintain in accordance with the order and decree of the Circuit Court of the United States for the District of Connecticut, passed June sixteenth, eighteen hundred and

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eighty-four, in the case of The Holyoke Water Power Company against the Connecticut River Company.

"SEC. 3. That the said Connecticut River Company shall build coincidentally with the construction of the said dam and appurtenances, at a location to be provided by said corporation and approved by the Secretary of War, and in accordance with plans approved by the Secretary of War and the Chief of Engineers, a lock of such kind and size, and with such equipment and appurtenances as shall conveniently and safely accommodate the present and prospective commerce of the river, and when the said lock and appurtenances shall have been completed the said corporation shall convey the same to the United States, free of cost, together with title to such land as may be required for approaches to said lock and such land as may be necessary to the United States for the maintenance and operation thereof, and the United States shall maintain and operate the said lock and appurtenances for the benefit of navigation, and the said corporation shall furnish to the United States, free of charge, water power, or power generated from water power, for operating and lighting the said constructions; and no tolls or charges of any kind shall be imposed or collected for the passage of any boat through the said lock or through any of the locks or canal of said corporation.

"SEC. 4. That compensation shall be made by the said Connecticut River Company to all persons or corporations whose lands or other property may be taken, overflowed, or otherwise damaged by the construction, maintenance, and operation of the said dam, lock, and appurtenant and accessory works, in accordance with the laws of the State where such lands or other property may be situated; but the United States shall not be held to have incurred any liability for such damages by the passage of this act.

"SEC. 5. That upon the termination for any cause whatever of the authority, rights, and privileges granted hereby, or any renewal thereof, the United States may renew the same or the grant may be made or transferred to other parties. Unless the grant is renewed to the original grantee or its assigns, as herein provided, the United States shall pay or require its new grantee to pay to said original grantees or its assigns, as full compensation, the reasonable value of the improvements and appurtenant works constructed under the authority of this act and of the property belonging to said corporation necessary for the development hereby authorized, exclusive of the value of the authority hereby granted. Said improvements and appurtenant works and property shall include the lands and riparian rights acquired for the purposes of such development, the dam and other structures, and also the equipment useful and convenient for the generation of hydroelectric power or hydromechanical power, and the transmission system from generation plant to initial points of distribution, but shall not include any other property whatsoever. Such reasonable value shall be determined by mutual agreement between the Secretary of War and the owners, and, in case they can not agree, then by proceedings instituted in the United States district court for the condemnation of such properties. The basis for determining the value shall be the cost of replacing the structures necessary for the development and transmission of hydroelectric power by other structures capable of developing and transmitting the same amount of marketable power with equal efficiency, allowance being made for deterioration, if any, of the existing structures in estimating such efficiency, together with the fair value of other properties herein defined, to which not more than ten per centum may be added to compensate for the expenditure of initial cost and experimentation charges and other proper expenditures in the cost of the plant which may not be represented in the replacement valuation herein provided.

"SEC. 6. That the right to alter, amend, or appeal this act is hereby expressly reserved."

After twice reading, this bill was referred to the Committee on Commerce and reported without amendment on Jan. 20, 1913, by Mr. Burton, representing a majority of the committee. This report, accompanying Senate 8033, in view of its importance, is given in full.

"The majority of the Committee on Commerce, to which was referred the bill (S. 8033) to authorize the Connecticut River Co. to relocate and construct a dam across the Connecticut River above the village of Windsor Locks, in the State of Connecticut, report the same to the Senate without amendment, and recommend that the same do pass.

"This bill provides a means by which, without expense to the Federal Government, a very important section of the Connecticut River between the towns of Hartford, Conn., and Springfield and Holyoke, Mass., may be improved for pur-

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poses of navigation. This reach of the stream contains a heavy fall known as the Enfield Rapids, which constitute a serious obstacle to its navigability. At present the practical navigation of the stream for commercial purposes ceases at the city of Hartford. Above this point the river is navigable only for boats of slight draft and small capacity. Somewhat more than 80 years ago the State of Connecticut chartered the Connecticut River Co., which is the grantee under this bill, as a navigation company, and for the purposes of affording navigation around these rapids the said company constructed a canal and lock, which it still operates. Originally the revenues of the company were derived from tolls imposed upon boats using this canal. At a later date the water power created by their dam was commercially utilized and the company thereafter derived its revenues from this source and voluntarily abolished the tolls. Subsequently the State of Connecticut amended the charter of the navigation company, granting it the right to generate, use, and sell hydroelectric power.

"The conditions in this stream are typical of a large class of river improvements which the Federal Government is called upon to make. The large expenditures already required to improve rivers more naturally suited to purposes of navigation usually preclude the possibility of attempting to improve streams of comparatively small flow, or where obstructed with difficult rapids, unless a large portion of the expense can be derived from the stream itself by utilizing the value of the water power possibilities. In principle it would appear to be eminently just that revenues for improving streams of this class should be derived from the privilege granted and not assessed against taxpayers in general. It would also seem exceedingly desirable that the maximum beneficial use of streams, both for navigation and water power, should be secured in the interest of the fullest conservation of our natural resources. Evidently the improvement of certain streams can best be accomplished where these two purposes are coordinated and carried on together.

" In the present instance this bill grants to the Connecticut River Co. the right to construct a dam at a point in the Connecticut River below a line crossing both channels of the river and Kings Island midway between its northerly and southerly end. The act provides that the dam shall be constructed in accordance with the provisions of the general dam act, approved June 23, 1910, with certain modifications, which will be noted in the subsequent portion of this report.

"According to the provisions of the bill a lock must be constructed in connection with the dam of such size and design as the Chief of Engineers and the Secretary of War may require. The plan if carried out will thus provide slack-water navigation between Hartford and Holyoke, adequate to meet the present and prospective commerce of this reach of the stream. The dam will also develop the full power possibilities of this portion of the river.

" It appears to be a settled question that the Federal Government may impose a charge for the use of the surplus water, not needed for purposes of navigation, which may be made available incidentally to the construction of a dam by the Federal Government for purposes of navigation. It would seem equally evident that the Federal Government also has the right to utilize a private agency for the construction of dams in aid of navigation, granting the use of the incidental water power thereby created to the constructing company in compensation, and requiring such other return as the circumstances may warrant.

" The bill presented marks the most distinct step yet taken toward this method for the improvement of navigation in combination with hydroelectric development under the control and supervision of the Federal Government, but without Federal expenditure. In addition to the requirement that the company shall construct the dam, lock, and all works appurtenant thereto, without expense to the Federal Government, it is also provided that the Secretary of War, as a part of the conditions and stipulations referred to in the general dam act, may in his discretion impose a reasonable annual charge or return to be paid by the said corporation or its assigns to the United States, the proceeds thereof to be used for the further development of navigation in the Connecticut River and waters connected therewith. It is provided, however, that no charge shall be imposed which shall be such as to deprive the said corporation of a reasonable return upon its actual and necessary investment.

" The public interests seem to be fully safeguarded in this instance against exorbitant charges, because the generation and sale of electricity in the territory covered by this development are under the jurisdiction, both in Connecticut and Massachusetts, of well-organized utility commissions under State authority. It is believed that the authority of the Secretary of War to require a return to the

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Government in case the corporation earns more than a reasonable return upon its bona fide investment will be in effect a regulation of the charges of the company as well as a source of revenue to the Government, because it will be one of the most important factors to be taken into consideration by the commissions mentioned in fixing the rates of service which the company may charge. The provision, therefore, complies with the recommendation of the National Waterways Commission in its final report (p. 61), which reads as follows:

"'*Charges and regulation.*—That a grant for water-power development constitutes a special privilege, for which the Government is entitled to proper compensation, is a principle which should be clearly established. The actual value of such privilege will, of course, vary greatly under different conditions. Every grant of the Government should, however, be dependent on the payment of such reasonable charges as may be determined by the circumstances and equities involved in each case. The commission does not suggest or advise that this right or power of Congress should be invoked as a means of raising revenue for general purposes, but only to reimburse the Government for the cost of surveys, inspection, and similar expenses, and for the purpose of controlling the use of streams in the interest of the public.'

"The most important departures from the provisions of the general dam act as approved June 23, 1910, are as follows:

"In the first section it is provided that the Secretary of War may, in his discretion, for adequate reasons, extend the period for the completion of the dam two years beyond the prescribed limits of the general dam act. The extension of time contemplated appeared to the committee reasonable, considering the difficulty of construction likely to be encountered.

"In the same section it is provided that the rights and privileges granted under the act may not be assigned except upon the written authorization of the Secretary of War, except in pursuance of a decree of a court of competent jurisdiction. This provision was inserted with the intention of preventing its assignment for the purpose of creating monopolistic combination, a danger which should be carefully guarded against.

"Section 2 contains numerous provisions intended to insure the primary operation of the dam and lock in the interests of navigation, while section 8 provides for the construction of a lock, in accordance with plans to be approved by the Secretary of War and Chief of Engineers, coincidentally with the construction of a dam, and contains the provision of the general dam act requiring the company to convey the completed lock and appurtenances to the United States free of cost, together with such land as may be required for approaches and for the maintenance thereof, and to furnish the United States free of cost power for operating and lighting such lock and property.

"Section 5 contains a provision materially different from those of former grants of this character. It is provided that at the expiration of the 50-year period contemplated by the general dam act the original grant may be renewed, transferred to other parties, or withheld. In the event that the grant is transferred to other parties, the Government shall require as a condition of the transfer of the property that the new grantee shall compensate the original grantee for the property acquired at a reasonable valuation. In the event that the United States refuses to renew the grant it shall itself make such compensation.

"This provision is based upon the theory that if the Federal Government restricts its grantee to reasonable earnings, which appears to be a policy necessary to enforce in the interests of the public, it shall also provide, as far as may be expedient, for the security of the necessary bona fide investment. The effect of this stipulation will be to cure, in its application to this grant, an undoubted defect of the general dam act and to make this system of legislation conform to the well-known methods obtaining in the case of long leases of land, providing for an appraisal and purchase of improvements at the expiration of the lease.

"The majority of the committee feel that the provisions contained in this bill are exceedingly desirable, both in the interests of an enlarged improvement of a certain class of streams and also for the utilization of our water powers under provisions which will safeguard fully the public interests, and therefore earnestly recommend the passage of this bill.

"Attached hereto will be found copy of a letter from the Secretary of War, addressed to the chairman of the Senate Committee on Commerce, which indicates that he is fully in accord with the provisions of the bill."

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WAR DEPARTMENT, *Washington, January 2, 1913.*

MY DEAR SENATOR: I beg to respond to the kind request of your committee for an expression of my views as to—

"A bill for the improvement of navigation of the Connecticut River and authorizing the Connecticut River Company to relocate and construct a dam in said river above the village of Windsor Locks, in the State of Connecticut."

It is understood that this bill is intended to replace three bills of a similar import, as to which I reported to your committee under date of April 18 last.

As reported to me by the Chief of Engineers, the Connecticut River between Hartford, Conn., and Holyoke, Mass., calls for improvements in the interest of navigation which are delayed owing to the very large cost of such improvements if independently undertaken by the Government. If, however, the improvement of navigation could be combined with a project for water-power development, whereby the cost of the improvement demanded by the interest of navigation would not devolve upon the Government, the adoption of such a plan would be plainly in the public interest. The bill now under consideration seeks thus to combine the commercial interests of navigation with the interests of water-power development and, it is believed, provides the most economical method of securing the improvement of the river sufficient for the present and prospective commerce. From the reports submitted to Congress, in accordance with the river and harbor act of March 3, 1909 (H. Doc. No. 818, 61st Cong., 3d sess.), it appears that the lock necessary for navigation purposes alone was estimated to cost $430,000; and, inasmuch as this estimate was made several years ago, it is probable that the cost to-day will be considerably larger. In addition to this, if the improvement of the Enfield Rapids were to be undertaken by the Federal Government directly, the necessity for purchasing flowage rights and extinguishing vested interests acquired under State law would add considerably to the actual cost of the work, and would doubtless present legal complications that would greatly embarrass the consummation of the improvement.

Therefore, from the standpoint of navigation, I am of the opinion that the project embraced in the bill whereby the lock and dam are built by the grantee as an agency of the Federal Government is very advantageous to the United States. On the other hand, the bill will give to the Connecticut River Co. very valuable water-power rights in connection with this work of improvement. The case thus falls within the principles which the President has laid down in his veto message of August 24, 1912, on the Coosa River Dam bill (S. 7343, 62d Cong., 2d sess.) and calls for a reassertion of the views I have heretofore expressed on bills of similar import, as to which I have previously reported to your committee. In other words, I think the bill should not become law unless a provision is added giving the Secretary of War authority, as one of the conditions of the privilege granted by the act, to require the grantee to pay to the United States a reasonable annual return, after making due allowance for construction, renewals, depreciation charges, and a reasonable return to the grantee on his bona fide investment, such proceeds to be devoted to the interests of navigation. With such a provision, I am of the opinion that the bill is in the interests of the public, and I strongly urge enactment.

After conference with the representatives of the Connecticut River Co., they have consented to the insertion in the bill of an amendment to meet my views as to the provision for compensation which I deem vital to its enactment. It is contained in the last proviso of section 1 of the inclosed draft of the bill. I have also examined the remainder of the annexed draft, containing certain minor amendments proposed by the Connecticut River Co., and believe that the interests of the Government, from the standpoint of my department, are adequately safeguarded thereby.

Very respectfully,

HENRY L. STIMSON,
Secretary of War.

Hon. KNUTE NELSON,
Chairman of Committee on Commerce, United States Senate.

A minority of the Committee on Commerce, represented by Mr. Bankhead, dissented from the report of Mr. Burton, and submitted a minority report suggesting certain amendments. These amendments consisted of the striking out of the provisions regarding assignment of rights and privileges granted, and of the provision allowing the Secretary of War to impose an annual charge upon the corporation.

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The bill, as amended, was passed by the Senate on February 17, 1913. As in its amended form there was little likelihood of its passing the House, an attempt was made to attach it as a rider to the general rivers and harbors bill. The failure of this attempt leaves the consideration of this matter to be renewed at the coming session of Congress.

The failure of Senate No. 8033 leaves the whole question of navigation at Enfield Dam again in abeyance. Upon the judicious adjustment of this situation depends the whole matter of Connecticut River improvement above Hartford. The board strongly recommends the expression of a vigorous public sentiment in favor of the enactment by Congress of a law similar to Senate No. 8033 as the essential condition of free navigation of the Connecticut River above Hartford.

CONCLUSIONS AND RECOMMENDATIONS.

The conclusions and recommendations of the Connecticut Valley Waterway Board are:

1. The demands of the cities and towns in the Connecticut River Valley between Holyoke and the southerly boundary line of Massachusetts for ample facilities for navigation on the Connecticut River from Long Island Sound to the present head of navigation near the Holyoke Dam, in order that they may benefit by a saving in freight charges on coal, cotton, lumber, and other commodities which might be brought by water, and on manufactured articles which might be shipped by water from this community, should be urged before Congress. The State of Massachusetts, if necessary, should cooperate with the cities and towns in that section of the Commonwealth by making sufficient appropriations for defraying a part of the cost of doing such work as may be required by plans and projects which may be adopted by the Federal Government for providing such facilities for navigation.

2. The depth of water which should now be provided in that part of the Connecticut River between Hartford and Holyoke should be not less than that now available from Long Island Sound to Hartford. A depth of 12 feet would enable the class of barges which now pass through the new Barge Canal to proceed through Long Island Sound and up this river as far as Springfield and Holyoke. Whenever the present depth to Hartford is increased, a corresponding increase should be made in the depth of the channel as far as Holyoke.

3. In any law enacted by Congress for the construction of a dam across the Connecticut River at any point thereon between the mouth of said river and the Holyoke Dam, it should be provided that a lock be built in said dam of sufficient dimensions for the convenient passage of water craft. Plans for said dam should provide for a depth over the sill in the lock not less than the ultimate depth to be provided in said river between its mouth and Hartford.

4. Any law enacted by Congress for the construction of a dam across the Connecticut River at any point thereon between the mouth of said river and the Holyoke Dam, which provides not only for the improvement of navigation but also for the development of power for commercial or other uses, should require payment to the Federal Government for the privilege granted.

5. It is recommended that in case any corporation, duly authorized by Congress to relocate and construct a dam across the Connecticut River at Windsor Locks, in the State of Connecticut, should fail to build the same, then the board of harbor and land commissioners, acting jointly with representatives of the State of Connecticut, shall investigate the matter and report to the general court such plan or plans as it may deem necessary or desirable for relocating and constructing said dam, with a lock therein, the work to be done by the State of Massachusetts and the State of Connecticut acting jointly, for the purpose of improving navigation on said river and developing and utilizing the water power at this locality.

6. The several cities and towns bordering on the Connecticut River in the State of Massachusetts, both above and below the Holyoke Dam, should acquire, by purchase or otherwise, a part of the water front, the same to be reserved for commercial purposes and use in connection with an improved river channel.

7. The several cities and towns bordering on the Connecticut River should build, equip, operate, and control such piers, wharves, docks, and landings on the river frontage, with suitable rail connections between the same and any existing railroad, as may from time to time be necessary for use in connection

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with an improved river channel, there being at the present time an opportunity to acquire land for this purpose, under favorable conditions.

8. The Commonwealth should cooperate with the several cities and towns bordering on the Connecticut River in providing channels of approach from the main channel and terminal basins in said river, to such piers, wharves, docks, and landings, as may be necessary, and should pay the cost of providing such approach channels and terminal basins.

9. River lines should be established by the Commonwealth from time to time along the Connecticut River, limiting the projection into the river of structures built along its banks under authority of law.

10. A survey should be made by the board of harbor and land commissioners for the purpose of determining the depth of water and the character of the bottom of the river from a point a short distance below the Holyoke Dam to the northerly boundary line of Massachusetts; also surveys, plans, and estimates of cost of providing canals, locks, and other necessary works at or near the rapids and dams on said river at Holyoke and Turners Falls, also at French King Rapids and at all other places on said river where work of this character would be necessary in reopening to navigation the whole length of the Connecticut River in Massachusetts above the Holyoke Dam.

11. Surveys and examinations should be made by the board of harbor and land commissioners of the tributaries of the Connecticut River for the purpose of ascertaining facts concerning water power, improved and unimproved, and other necessary and useful data.

12. It is recommended that further appropriations be made for protective work along the banks of the Connecticut River; also appropriations for such work along the banks of the tributaries of said river, to be carried out in such places and to such extent as the board of harbor and land commissioners may deem necessary; and that all work of this character be done under the charge and direction of said board.

13. It is recommended that legislation be provided authorizing and directing the board of harbor and land commissioners, acting with such representatives of the States of New Hampshire and Vermont as may be appointed for the same purpose, to consider and formulate plans for conserving the headwaters of the Connecticut River.

14. The board recommends that the legislature adopt resolutions in favor of a full and complete development of the entire length of the Connecticut River in Massachusetts, and that the Commonwealth cooperate with the Federal Government in carrying into effect projects of improvement for the benefit of navigation, and appropriate from time to time the necessary funds for use in connection with such appropriations as may be made by Congress for the improvement and development of the whole river in accordance with such plans and projects as may be adopted by the United States.

WILLIAM S. MCNARY,
Chairman.
CHARLES P. CHASE,
JAMES J. O'DONNELL,
Connecticut Valley Waterway Board.

MARCH 12, 1913.

LETTER OF THE CONNECTICUT RIVER CO.

SPRINGFIELD, MASS., *March 10, 1915.*

DEAR SIR: The Connecticut River Co. does not feel like incurring any expense for engineering advice necessary to get further information on the question of water-power development and navigation, our reason being that we have already been to a great expense on this matter and have never had any cooperation from Congress.

The company was chartered in 1828 to improve navigation on the Connecticut River, and they did improve it after an expenditure of a great deal of money by building a canal 6 miles long around the Enfield Rapids. Later on a dam was built across the river to further improve this navigation. This dam and its improvements were started at the time of putting in the canal.

The company is chartered to improve navigation on the Connecticut River and has always been willing to do everything it could, even to having free tolls, but conditions of navigation have changed from the old days, and the

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canal locks are too short and narrow to make any amount of navigation possible, and we have our plans ready and are prepared to commence construction on the relocation of the dam, all on our own property, but at the foot of the rapids instead of at the head of the rapids.

For the right to relocate this dam we have been petitioning Congress for the last six years, and have never met with any success, for the reason that Congress has been quarreling over a general act to allow all companies to build dams, and refuses now to grant special permits, as was the case a few years ago, for companies already doing business, and nobody knows when they willl ever be able to make up their mind on a general bill. We never heard anything urged against our request for the right to relocate the dam, but were told to wait until they could get the general act agreed to, which seems to me will take probably another generation.

Very truly, yours,

CHARLES H. TENNEY,
President, The Connecticut River Company.

Maj. G. B. PILLSBURY,
Corps of Engineers.

LETTER OF BOARD OF HARBOR AND LAND COMMISSIONERS.

STATE HOUSE, BOSTON, MASS., *March 17, 1915.*

SIR: The board of harbor and land commissioners acknowledges receipt of your letter of March 15, 1915, relating to the survey of the Connecticut River, between Hartford and Holyoke, and certain recommendations made in the report of the Connecticut Valley Waterway Board, with reference to improvement of this river and cooperation by the Commonwealth. No definite plan of cooperation on the part of the State and local interests has been decided upon, but this board is prepared to indorse, and to advocate before the governor and council and any committee of the Massachusetts Legislature, the adoption of the recommendations contained in the report of the Connecticut Valley Waterway Board which include cooperative action between the Commonwealth of Massachusetts, the several cities and towns bordering on the Connecticut River, and the Federal Government necessary to carry into effect any project for the improvement of this river for purposes of navigation.

Respectfully, for the board,

WM. S. MCNARY, *Chairman.*

Maj. G. B. PILLSBURY,
Corps of Engineers.

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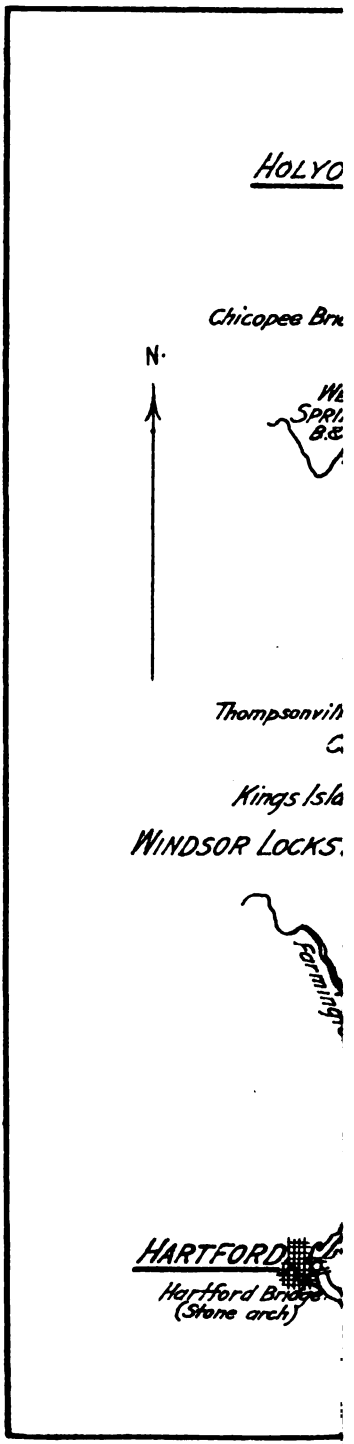
WAR DEPARTMENT



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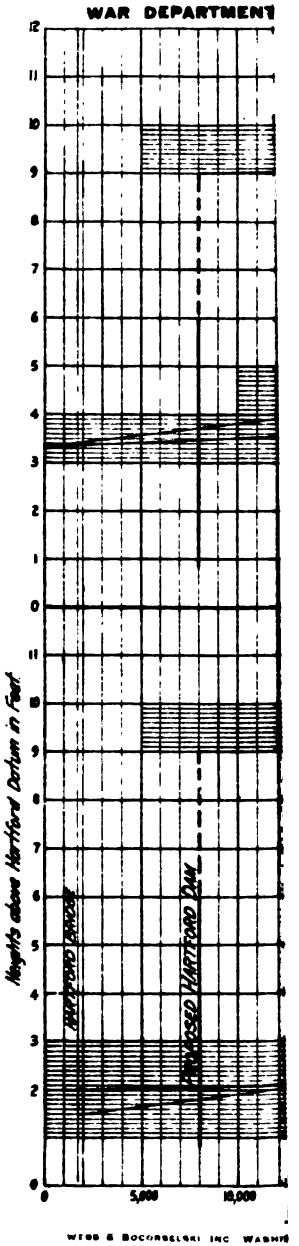

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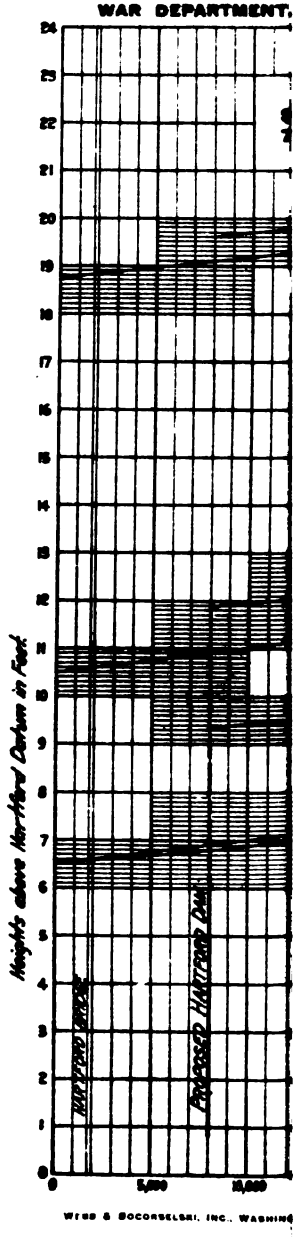

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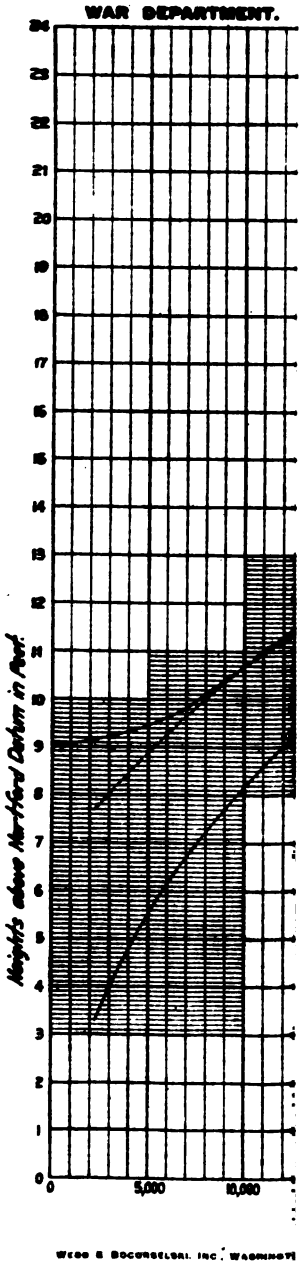

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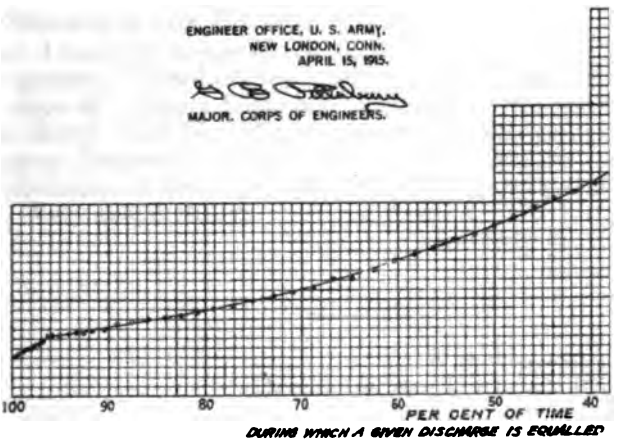
WAR DEPARTMENT.

FLOW OF CONNECTICUT RIVER AT ENFIELD RAPIDS.

FROM HOLYOKE READINGS, 1881-1899, INCREASED BY 15½% AND ARRANGED IN ORDER OF MAGNITUDE, WITHOUT REGARD TO

DRAINAGE AREA HOLYOKE, 8660 SQUARE MILES.

DRAINAGE AREA ENFIELD RAPIDS 10,006 SQUARE MILES.



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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 418.

BAYOU PLAQUEMINE BRULÉ, LA.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF BAYOU PLAQUEMINE BRULÉ, LA., WITH A VIEW TO THE EXTENSION OF THE IMPROVEMENT.

DECEMBER 16, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 15, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated October 22, 1915, together with copy of a report from Maj. Edward H. Schulz, Corps of Engineers, dated June 30, 1915, with map, on preliminary examination of Bayou Plaquemine Brulé, La., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, October 22, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Bayou Plaquemine Brulé, La.

1. There is submitted herewith for transmission to Congress report dated June 30, 1915, with map, by Maj. Edward H. Schulz, Corps of

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Engineers, on preliminary examination authorized by the river and harbor act approved March 4, 1915, of Bayou Plaquemine Brulé, La., with a view to the extension of the improvement.

2. The existing project for the improvement of this bayou, which has recently been completed at a total cost of $32,930.14, provides for a channel 6 feet deep and 60 feet wide from the mouth to a point 19 miles above, adjacent to the Roller pump plant near the town of Crowley. The district officer reports that the portion of the stream above the pump plant is narrow, tortuous, and badly obstructed by logs, snags, etc., and while good water exists in some places, there is practically no depth in others. There does not appear to be any commerce, present or prospective, which would justify the improvement of this portion of the stream by the United States, and he therefore expresses the opinion, in which the division engineer concurs, that extension of the improvement of Bayou Plaquemine Brulé is not warranted.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated September 15, 1915, concurring in the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Bayou Plaquemine Brulé, with a view to the extension of the improvement is not deemed advisable at the present time.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 15, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. The following is in review of the district officer's report on preliminary examination of Bayou Plaquemine Brulé, with a view to the extension of the improvement called for by the act of March 4, 1915.

2. Bayou Plaquemine Brulé flows into Bayou Des Cannes a short distance above the point where the latter stream unites with Bayou Nezpique to form the Mermentau River. The existing project, which has recently been completed at a total cost of $32,930.14, provides for a channel 6 feet deep and 60 feet wide from the mouth to a point 19 miles above, adjacent to the Roller pump plant, near the town of Crowley. The present investigation has in view the improvement of the bayou above the Roller plant. The district officer reports that this portion of the bayou is tortuous, with very sharp bends, and while fairly good water exists in some places, there is practically no depth in others. Everywhere there is a great accumulation of logs, snags, etc., together with large trees at the water's edge. There does not

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appear to be any commerce, present or prospective, to justify the improvement of this portion of the stream by the Federal Government, and the district officer therefore expresses the opinion, in which the division engineer concurs, that extension of the improvement of Bayou Plaquemine Brulé is not warranted.

3. Interested parties were informed of the unfavorable report of the district officer and invited to submit statements to the board, but no communications on this subject have been received.

4. It appears from the data derived from the examination that Bayou Plaquemine Brulé above the limits of the present project is narrow, tortuous, and shallow and is badly obstructed by logs, snags, etc. There appears to be little or no present commerce and no prospect of the development of sufficient commerce in the near future to warrant the improvement of this section. The board therefore concurs with the district officer and the division engineer in the opinion that it is not advisable for the United States to undertake any extension of the improvement of Bayou Plaquemine Brulé.

5. In compliance with law, the board reports that there are no questions of terminal facilities, waterpower, or other related subjects which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

For the board:

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

PRELIMINARY EXAMINATION OF BAYOU PLAQUEMINE BRULÉ, LA.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
New Orleans, La., June 30, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Preliminary examination of Bayou Plaquemine Brulé, with a view to the extension of the improvement.

1. The following report on preliminary examination of Bayou Plaquemine Brulé, with a view to the extension of the improvement, is submitted, under the provisions of the river and harbor act of March 4, 1915, and in compliance with department instructions of March 15, 1915. A reconnoissance of the stream was made on May 25 and 26 and a personal inspection of a portion on June 29, 1915.

2. Two maps are submitted herewith. Sheet No. 1[1] shows the general location of the upper portion of Bayou Plaquemine Brulé (B–F), from the Roller plant to the town of Church Point, La. There is also shown, by smaller scale sketch, the relation of Bayou Plaquemine Brulé to the other streams of the Mermentau Basin. Sheet No. 2[2] gives cross sections of the stream extending from the Roller canal to a point approximately 7 miles above.

[1] Index portion only printed. [2] Not printed.

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3. The improvement of Bayou Plaquemine Brulé has recently been completed from its junction with the Des Cannes to a point 19 miles above, near the town of Crowley. (See A–B, sheet 1.) The project was for a depth of 6 feet and a width of 60 feet, and the total cost was $32,930.14, or about $1,733 a mile. This stream in its natural state had various depths and widths, and while it had a large depth in the center, the side depths were rather small and the stream generally throughout was badly obstructed by logs and overhanging trees.

4. The Plaquemine Brulé is a tributary of the Mermentau Basin. It rises about 21 miles above Church Point and flows generally southwest for a distance of about 70 miles, and empties into the Des Cannes about 3½ miles above the town of Mermentau. The Mermentau River enters the Gulf of Mexico about 15 miles east of the Calcasieu River and 64 miles west of the Vermilion River. This stream has a general depth of 6 feet and varying widths, including Grand Lake of about 61 square miles area. At a point 71½ miles from the Gulf the Mermentau is formed by the junction of Bayou Nezpique and Bayou Des Cannes. There is a railroad bridge (Southern Pacific) which crosses the Mermentau about 2¼ miles below the junction of the Nezpique with the Des Cannes. A branch of the Southern Pacific also crosses the portion of the Plaquemine Brulé recently improved near the town of Midland. The Frisco Railroad crosses near Crowley and the Opelousas, Gulf & Northeastern Railroad at Church Point.

5. The purpose of the United States improvement recently completed has been to obtain transportation between the Mermentau River and the town of Crowley, and this improvement has now reached as close to the city as can be done. It may be stated, however, that a tributary of the Plaquemine Brulé, known as Medlenka River (see B–D, Sheet 1), is now being improved by public local interests, extending from the Roller plant to near the town of Crowley, a distance of about 4,200 feet. This local improvement is made both for drainage and navigation purposes. It is the intention to have a turning basin at the head of the canal, with railroad facilities and a wharf.

6. No improvement has been made of the Plaquemine Brulé prior to the work recently completed. Previous report and examination will be found as follows:

House Document No. 789, Sixtieth Congress, first session. This document contains the report of February 7, 1908, recommending a project for providing 6-foot draft from mouth of Plaquemine Brulé to near the town of Crowley, with a width of 60 feet. The first appropriation was made by act of June 25, 1910, in accordance with the report in this document.

7. The object of the new survey is to ascertain the condition of the stream above the Roller plant. No definite extent of stream was stated, and the stream has been examined as far up as practicable.

8. *Commerce.*—The commerce on the portion of the Plaquemine Brulé recently completed for the past year is as follows:

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Article.	Amount.		Valuation.	Average haul or distance freight was carried.	Ton-mile statistics.
	Customary units.	Short tons.			
				Miles.	
Logs	1,500,000 feet	7,500	$150,000	20	150,000
Lumber	500,000 feet	1,000	10,000	20	20,000
Miscellaneous merchandise	100 tons	100	10,000	15	1,500
Oil, fuel	10,000 barrels	1,550	12,400	15	23,250
Wood	500 cords	500	20,000	15	7,500
Total		10,650	202,400		202,250

9. Mr. J. G. Medlenka, president of the Crowley Board of Trade, reports that, in his judgment, the commerce on the lower Plaquemine Brulé will shortly be 24,500 tons, and that the total tonnage affected will be over 100,000 tons.

10. Regarding the commerce on the portion of the stream now under consideration, no definite information can be obtained. A portion is now being improved by local interests (the Louisiana Irrigation & Milling Co.) from the Roller plant to the Crowley plant, a distance of about 3 miles. (See B–E, sheet 1.) The channel is to be about 10 by 30 feet, and the estimated cost is $15,000. The dredge was floated up at high water and is moving downstream—now working at a point about 7,000 feet above the Roller plant. The object of this improvement is to obtain water for rice culture and also to provide navigation facilities for the oil and lumber used in the irrigation plants and canals. It is estimated this annual supply will amount to about 1,800 tons of oil and 400 tons of lumber, and will undoubtedly come in by water when the work is finished.

11. A letter from Hon. L. Lazaro, M. C., written concerning the Plaquemine Brulé, as well as the Bayous Courtableau, Cocodrie, and Boeuf, states as follows:

> The land along these streams is very fertile and grows large quantities of cotton, rice, corn, sugar cane, Irish and sweet potatoes, and other agricultural products; there is also timber in quantity which could be taken out with water transportation.
>
> Several modern cotton gins, sawmills, and a cane-sirup factory are along the banks of these streams.
>
> I believe the present and prospective commerce of these bayous are believd to be sufficient to justify their improvement by the United States. I think the time is ripe for the Federal Government to improve these important waterways and thereby give our producers better transportation facilities and lower freight rates.

Mr. W. B. Robert, civil engineer, of Opelousas, La., states that the distance from the Roller plant to the source of the stream in St. Landry Parish is about 30 miles (air line), and that an area of about 80,000 acres is drained by the bayou, and that by sufficient dredging and locks a watercourse could be maintained in which to carry on a barge trade.

12. The reconnaissance recently made began at mile 19, which is the present head of navigation. A launch was used, but it was impossible to proceed more than 1½ miles, owing to fallen timber. From mile 1½ to mile 3 the stream had recently been dredged by private

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interests, as stated above. The rest of the journey up to the 7-mile point was made on horseback. It was not considered advisable or necessary to make any special examination farther up the stream. Sections were taken approximately at points one-fourth mile apart and are shown on sheet 2 herewith. As far as the stream was examined the indications of the survey showed fairly good water in several places, but in other places there would be practically no depth. Everywhere there was a great accumulation of logs, snags, etc., together with large trees at the water's edge, all of which would have to be dynamited if dredging were undertaken. The bayou is very tortuous, with most of the bends so sharp that a double-width channel at such places would be required to allow a 50-foot boat to navigate.

13. Above the 7-mile point it was very difficult to follow the course of the stream, and there were no landmarks or bridges to locate definitely any of the sections. The character of the stream varies but little from mile 7 up to Church Point. The bayou is reported to have a good fall, and there is as much as a 20-foot difference in elevation between Church Point and Crowley. The bayou runs through a natural depression of country about one-half to 3 miles wide, with good, steep banks, the general elevation of the prairie being 20 to 30 feet above the bed of stream. There are only a few houses between the ridge line and the bayou. The tributary population between Crowley and Church Point is about 2,000. The present probable production of this population is 200 tons of rice, 1,000 tons of cotton, and 2,500 tons of corn. All cultivated lands are on the prairie behind the ridge line, old cut-over woods and pasture lands lying between ridge line and water.

14. The following characteristics of the first 7 miles (B–C) may be noted: A canal enters the stream on the right bank at the 1½-mile point, one enters near the 3-mile point on the left bank, and one at the 4¼-mile point on the right bank. Bayou Wikoff enters the main stream from the left bank at the 5¾-mile point. There is a parish bridge across the stream at the 3-mile point and one at the 7-mile point. The Frisco Railroad bridge crosses near the 2-mile point; has a span of 13 feet between pile bents and a vertical clearance of about 18 feet. At the 5-mile point there is a small earth dam across the stream.

The minimum width and depth and average width and depth for each mile from mile 0 to mile 7 are as follows:

Mile.	Width.			Depth.			Water surface above mean low Gulf.	Minimum depth at mean low Gulf.
	Maximum.	Minimum.	Average.	Maximum.	Minimum.	Average.		
	Feet.	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*	*Feet.*
1	65	59	61.5	9.7	5.0	8.2	+1.2	2.8
2	55	40	48.8	8.2	4.7	6.1	+1.2	3.5
3	55	30	40.0	11.0	2.0	6.4	+1.2	.8
4	49	19	33.7	10.5	1.0	3.9	+1.5	−.5
5	58	10	37.2	8.3	.3	3.2	+1.8	−1.5
6	60	30	47.0	3.0	3.0	4.5	+2.0	1.0
7	40	20	32.2	3.0	.5	1.9	+2.0	−1.5

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The maximum depth for the 7 miles is 11 feet, and the maximum width about 65 feet. In the upper portion the actual depths found were due to pools formed by log jams; the elevation of bed of stream in places is actually above mean low water. Trees, snags, etc., almost continuously line or lie in the stream.

15. From the investigation it is evident that at present there is no traffic on Bayou Plaquemine Brulé above the Roller plant and that no parties are deeply interested in the upper waters. The main function of the upper stream at present is to act as a feeder to the various irrigation plants owned by the rice farmers, and to furnish such navigation as may develop for the first 3 miles, due to the channel now being dredged as described above in paragraph 10.

16. There does not appear to be any commerce, present or prospective, to justify the improvement of this portion of the stream by the Federal Government. Moreover, the actual cost of improvement would be very high. It is, therefore, considered, and recommended, that extension of the improvement of Bayou Plaquemine Brulé is not warranted, and that no further survey and report be made.

EDWARD H. SCHULZ,
Major, Corps of Engineers.

[First indorsement.]

OFFICE OF DIVISION ENGINEER, GULF DIVISION,
New Orleans, La., August 30, 1915.

To the CHIEF OF ENGINEERS.

1. Forwarded.

2. Having personally examined a portion of this bayou, I am satisfied that the amount of navigation that might be developed by the desired improvement, if made, would be small and entirely incommensurate with the cost of the work. The views and recommendations of the district officer are concurred in.

J. C. SANFORD,
Colonel, Corps of Engineers,
Division Engineer.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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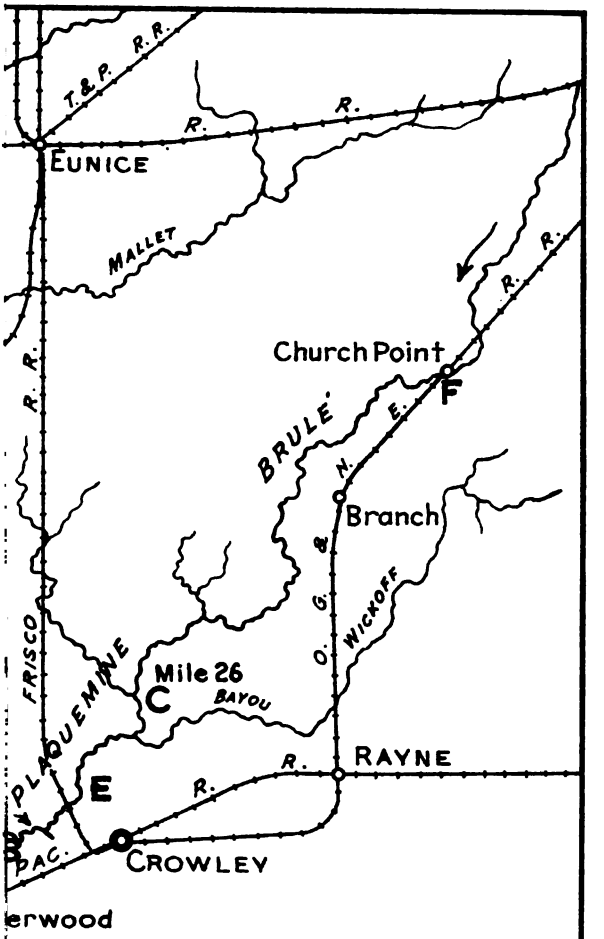
CORPS OF ENGINEERS, U.S.A.



AYOU PLAQUEMINE BRULÉ, LA.

AND VICINITY

Scale of Miles

5 4 3 2 1 0 5

To accompany preliminary report of Major Edward H. Schulz, June 30, 1915.

ntly completed.

eam.

examination

House Doc. No. ; 64th Cong., 1st Sess.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 419.

MISSOURI RIVER, KANSAS CITY, KANS., TO FLORENCE, NEBR.

LETTER

FROM

THE SECRETARY OF WAR.

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF MISSOURI RIVER, FROM KANSAS CITY, KANS., TO THE NORTHERN LIMITS OF FLORENCE, NEBR.

DECEMBER 16, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 15, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated August 11, 1915, together with copy of a report from Lieut. Col. Herbert Deakyne, Corps of Engineers, dated May 27, 1915, on preliminary examination of Missouri River from Kansas City, Kans., to the northern limit of Florence, Nebr., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, August 11, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Missouri River, Kansas City, Kans., to Florence, Nebr.

1. There is submitted herewith for transmission to Congress report dated May 27, 1915, by Lieut. Col. Herbert Deakyne, Corps of

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Engineers, on preliminary examination of Missouri' River from Kansas City, Kans., to the northern limit of Florence, Nebr., called for by the river and harbor act approved March 4, 1915.

2. This stretch of the Missouri River, having a length of about 280 miles, is part of the section between Kansas City and Sioux City. There is no adopted project for this section, but work has been carried on at isolated localities from the date of the earliest efforts to improve the river. The total amount expended on the stretch under consideration to March 4, 1915, is about $2,700,000. There is no commerce at present except sand that is dredged from the river and carried to nearby landings, and there appears to be no prospect of any material commercial development in the early future. Between Kansas City and the mouth improvement is in progress under a project providing for securing a permanent 6-foot channel by regulation and contraction, assisted by the removal of snags, at a total estimated cost of $20,000,000, or about $50,000 per mile. Commercial developments on this lower portion have not been such as to indicate the advisability at this time of making any extension of the project upstream. In the opinion of the district officer the improvement of the river between Kansas City and Florence is not advisable to any greater extent than the continuance of snagging operations, which are carried on under existing appropriations. The division engineer concurs in this opinion.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated July 27, 1915, concurring in the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Missouri River from Kansas City, Kans., to the northern limit of Florence, Nebr., is not deemed advisable at the present time to a greater extent than the continuance of snagging operations now carried on.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Fifth indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
July 27, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's report on preliminary examination of Missouri River from Kansas City, Kans., to the northern limit of Florence, Nebr., called for by the act of March 4, 1915.

2. There is no adapted project for this section of river, having a length of about 280 miles, but snagging is carried on under appropriations for the river from Kansas City to Sioux City, of which the

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reach under consideration is a part. Some bank protection and regulating works have been built in the past at isolated localities.

3. The total expenditure on this section has been about $2,700,000, but, generally speaking, the river is still in its natural condition. The channel changes frequently in position, the banks are subject to erosion, snags accumulate, and the bottom lands adjacent are generally subject to overflow. The navigable depth at ordinary low water is taken as 3 feet, but occasionally at very low stages it is less.

4. There is no commerce at present, except the sand that is dredged from the river in the immediate vicinity of the towns and carried short distances to the local landings, and there appears to be no prospect of any change in the near future.

5. While no estimate of cost of a permanent or systematic improvement is submitted, it is known from experience on the lower river that it would be approximately $50,000 per mile, or a total of about $14,000,000.

6. In view of the expensive project now under way from Kansas City to the mouth, coupled with the fact that commerce does not promise to develop to an extent commensurate with the cost, the district officer reports that it would be premature to take up another long section of river, and he expresses the opinion, in which the division engineer concurs, that improvement is not advisable to a greater extent than continuing the snagging operations, which cost about $12,000 a year on this reach and are now carried on under existing appropriations.

7. Interested parties were duly advised of the tenor of the district officer's report and given an opportunity of presenting their views. Two communications on the subject have been received and given consideration.

8. Much has been written of the splendid commerce that was once carried on this river, and of the great fleet of boats that traversed its waters, but little has been heard of the difficulties and hardships attending navigation in those days, or of the consequent high cost of transportation which exceeded many times the present rail rates. It was the knowledge of these conditions, rather than any depreciation or lack of navigable capacity of the stream, that gradually led the people to desert the river for the railroads. The river is in as good condition to-day as it ever was, but there is no through traffic and only a small local commerce that would not be greatly benefited by improvement. The continuation of the snagging now carried on will permit light draft vessels to use the river if they desire to do so, and there is no other form of improvement that would give commensurate returns. The board therefore concurs with the district officer and the division engineer, and reports that in its opinion it is not advisable at this time for the United States to undertake the improvement of the Missouri River between Kansas City, Kans., and Florence, Nebr., except to continue the snagging now carried on. This work is considered essential both in order to preserve the natural navigable capacity of this reach and to protect the river below Kansas City.

9. In compliance with law, the board reports that there are no questions of terminal facilities, waterpower, or other related subjects which could be coordinated with the suggested improvement in

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such manner as to render the work advisable in the interests of commerce and navigation.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

PRELIMINARY EXAMINATION OF MISSOURI RIVER, KANSAS CITY, KANS., TO FLORENCE, NEBR.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Kansas City, Mo., May 27, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Preliminary examination, Missouri River, Kansas City, Kans., to Florence, Nebr.

1. In accordance with instructions contained in department letter of March 15, 1915, I submit the following report on preliminary examination of Missouri River required by this item in the river and harbor act of March 4, 1915: Missouri River from Kansas City, Kans., to the northern limits of Florence, Nebr.

2. The examination was made April 13 to 15, 1915. In addition to traveling over this entire stretch of river at that time, I have made frequent inspections at various points between Kansas City and Florence during the past three years in connection with operations for improvement of the river. A map[1] is herewith showing the entire length of the Missouri River from which may be seen the relation of the stretch under consideration to the remainder of the valley of the Missouri. Kansas City, Kans., fronts on the Missouri River at the mouth of Kansas River, and also at the Quindaro pumping station, 6 miles farther upstream. The northern limits of Florence are at a point about one-half mile above the Omaha waterworks. The length of the portion of the stream under consideration, measuring from the mouth of Kansas River, is about 280 miles.

3. The most important places on this part of the river are Kansas City, Leavenworth, Atchison, and White Cloud in Kansas, Parkville and St. Joseph in Missouri, Rulo, Nebraska City, Plattsmouth, Omaha, and Florence in Nebraska, and Council Bluffs in Iowa.

4. The general characteristics of the Missouri River and its watershed have been described in many previous reports. It is sufficient to say that the stream is navigable to Fort Benton, Mont., 2,285 miles above its mouth, and that its watershed embraces an area of about 580,000 square miles. From the mouth of the Missouri a depth of 6 feet or more at low water can be carried to the Gulf of Mexico.

PREVIOUS REPORTS.

5. This stretch of river is included in the section from Sioux City to the mouth, which was the subject of a report published in

[1] Not printed.

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House Document No. 1120, Sixtieth Congress, second session. This report was favorable to improvement, and formed the basis for the project adopted by Congress July 25, 1912, for a 6-foot channel from Kansas City to the mouth, at an estimated cost of $20,000,000, with $500,000 a year for maintenance after completion. A report on the river in the vicinity of Omaha, South Omaha, Florence, and Dundee, was published as House Document No. 862, Sixty-second Congress, second session. The report was unfavorable to improvement. A report on the Missouri River from the mouth of the Kansas River to a point at or near the western limits of Kansas City, Kans., was called for by the act of July 25, 1912, and is published in House Document No. 913, Sixty-third Congress, second session. The report was unfavorable to the improvement to any greater extent than already authorized. Several reports on the river in the vicinity of Lake Contrary, near St. Joseph, have been made. They are published in House Documents No. 824, Sixtieth Congress, first session; No. 750 Sixty-first Congress, second session; No. 14, Sixty-third Congress, first session; and Document No. 5, Committee on Rivers and Harbors of the House of Representatives, Sixty-second Congress, second session. The reports in Documents Nos. 824, 750, and 5, recommended revetment of the bank at an estimated cost of $150,000, contingent upon local cooperation. The latest report, in Document No. 14, is unfavorable to the improvement.

PRESENT CONDITIONS.

6. For the greater part of the distance from Kansas City to Florence, the river is in its natural condition. This means that the channel is subject to frequent changes, banks are eroded, bars are formed, snags accumulate, and low bottom lands are overflowed. The navigable depth of the river can be placed at about 3 feet. The snag boat *McPherson*, drawing 2½ feet, travels over this part of the river a number of times each year. In 1913 the towboat *Lieut. Lewis*, drawing about 4 feet, traveled from Council Bluffs to Kansas City in November, when the river was at a low stage. She found considerable difficulty in navigating the river at that stage. The most unfavorable time for navigation, according to well-settled experience on the Missouri, is when the river is falling after a considerable rise. At that time the channel has not become fixed in its low-water position and has not had time to scour its way through the high bars formed during the rise. As a general statement, I should say that this part of the river is reasonably easy to navigate with boats drawing 3 feet or less, and that boats drawing more than 3 feet will find it difficult. Navigation is stopped by ice in the winter, the period of suspension being three to four months.

7. The river is subject to the fluctuations found in streams of this kind. In the winter the stream is low. There is usually a rise in April when the ice breaks in the upper river, then a period of moderately low stage, followed by a rise in June caused by melting snow at the headwaters and affected by the amount of rain along the lower reaches. After the June rise the river falls to a low stage that generally lasts through the late summer, the fall, and the winter, with an occasional small rise about November. The range between standard low and standard high water is about 12 feet. The bed and banks of

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the river are mostly sand and silt, easily eroded. The river carries a large amount of sediment and is very active in cutting away existing banks, building new ones, and building and removing bars. There are about 70 miles on this stretch where the river flows along the high bluffs. Navigation is obstructed by three bridges at Omaha, two at Leavenworth, and one each at Plattsmouth, Nebraska City, Rulo, St. Joseph, and Atchison. Four of these are drawbridges and six are high bridges that do not have to be opened for boats. The lowest point of superstructure of the high bridges varies from 48.5 to 53.9 feet above standard high water. The widest spans in the high bridges vary from 238 to 392 feet. The drawbridges are all of the double draw-span type, with widths of draw opening varying from 155 to 237 feet.

PREVIOUS IMPROVEMENT.

8. Work on this stretch of river has been carried on from the date of the earliest efforts at improving the river. No project has ever been adopted by Congress, but work has been done at many localities, the most important of which are Kansas City, Quindaro, Parkville, Leavenworth, Atchison, St. Joseph, Nebraska City, Plattsmouth, Folsom, Omaha, Council Bluffs, and Florence. At some of these localities much experimental work was done, which aided in developing useful types of structures, but was not itself of permanent value. The total amount expended on this part of the river to March 4, 1915, is about $2,700,000. There remains to show for this expenditure something like 15 miles of river protected by dikes and revetment. Some of these structures have deteriorated considerably and require frequent work to keep them in repair. Owing to lack of funds, dikes have been used in many places where more satisfactory but more expensive protection of banks could have been secured with revetment.

COMMERCE.

9. There is no present commerce of any considerable amount on this stretch of river. There are a few sand companies that dig sand from the river for use in the towns. Usually the sand is dug close to where it is placed on the bank for sale. There are several ferries used to transport passengers, animals, and vehicles across the river. There is no regular boat line in operation on this part of the river.

10. Formerly the river was extensively used for commerce. Figures are not available as to the amount of this commerce, the freight rates charged, and the difficulties under which it was carried on. From the number of wrecks that occurred on the river it may be taken for granted that the river was obstructed by bars and snags and that boats were subject to great delays. There is also no doubt that high freight rates compensated for the delays and losses incident to the business. Before the advent of railroads the river naturally was the main artery of traffic for the territory adjacent to it, its navigation being, in spite of all its drawbacks, far superior to land transportation. The railroads appear to have driven the traffic from the river by reason of their lower freight rates, their great saving of time for passengers, the reasonable regularity of their service, their all-year operation as against the interruption of navi-

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gation for three or more months in the winter, their independence of the river current, and their comparative freedom from disturbance by floods, winds, and fogs.

11. If there should be a revival of river traffic, the natural use of the river would be in the transportation of bulky nonperishable articles, for which rapidity and regularity of schedule are not essential. Coal, building materials, hardware, farm implements, fertilizers, grain, and hay are some of the things that might be expected to seek river transportation. Farm implements and fertilizers would have to be taken up the river in the fall to be ready for use in the spring. Wheat and hay should be brought down the river in the summer and fall, and corn would have to be kept through the winter and brought down in the spring. The other commodities might be expected to move at all times during the navigation season of eight to nine months. This would be general or through commerce, involving a development on broad lines, such as the carrying of grain from the agricultural States along the Missouri to New Orleans for export. There would also be a possibility of local commerce, such as the transportation of live stock from the farms to such centers as Omaha, St. Joseph, and Kansas City, and the shipment of provisions, clothing, furniture, and other necessities from these centers to smaller places along the river. While a development of this kind is among the possibilities, the question to be considered is whether it will probably amount to enough to warrant the expenditure necessary for improving the stream.

12. This prospective commerce is a question upon which there is room for a great divergence of views. The total commerce of the territory along the river undoubtedly runs up into hundreds of thousands, possibly millions, of tons. If any considerable part of this were transferred to the river it would make a substantial showing. But any rapid growth of river commerce into large figures does not appear to me probable. In another report[1] recently prepared, I pointed out that on the Missouri River from Kansas City to the mouth, where improvement has been in progress since 1910 to secure a permanent 6-foot channel, and where a boat line has been in regular operation since 1911, the commerce in the calendar year 1913 was 347,235 tons. This figure included 309,577 tons of sand and gravel dredged from the river and taken to landings near the place of removal, and 107 tons of logs and lumber rafted. These items are not affected by river improvement. Eliminating them, the commerce from Kansas City to the mouth for 1913 was 37,551 tons. Another example is the Mississippi River between the mouth of the Ohio and the mouth of the Missouri, which has a permanent channel 6 feet or more in depth. It carried in 1913 258,709 tons, excluding items not affected by improvement. From these examples there is good reason to regard as illusory any expectations that the commerce on the Missouri above Kansas City will amount to millions of tons in the near future if the river is improved.

13. A detailed estimate of the cost of improvement is not required in this report on preliminary examination, but a general idea of the cost may be obtained by comparison with the river below Kansas City, where a length of 390 miles is being improved at an estimated

[1] Not printed in this connection.

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cost of $20,000,000, or about $50,000 per mile. The estimated cost of maintaining the improvement after completion is $500,000 per year. The improvement is being made by revetment of the banks and control of the channel with dikes. The same kind of work would be required from Kansas City to Florence, a distance of about 280 miles, and the cost would be approximately in proportion to the length.

VIEWS OF INTERESTED PARTIES.

14. A circular letter[1] was sent to all persons or organizations supposed to be interested in the proposed improvement, requesting their views. Many replies were received, and those from the following are transmitted herewith to show the views of the parties who take the greatest interest in the subject:

Mr. John Donnelly, president board of fire and water commissioners, Kansas City, Mo.; Leavenworth Chamber of Commerce, Leavenworth, Kans.; St. Joseph Water Co. and Commerce Club, St. Joseph, Mo.; Mr. John G. Steinhart, postmaster, Nebraska City, Nebr.; Commercial Club (2), L. G. Doup Co., Walrath & Sherwood Lumber Co., Baker Ice Machine Co., Omaha Manufacturers' Association, Carpenter Paper Co., the Jerpe Commission Co., Baker Manufacturing Co., Paxton & Vierling Iron Works, Uncle Sam Breakfast Food Co., Carter Sheet Metal Co., Cole & Fry Co., H. J. Hughes Co., David Cole Creamery Co., M. E. Smith & Co., Omaha Crockery Co., McCord Brady Co., and H. F. Cady Lumber Co., Omaha, Nebr.

15. It will be noted that many of these letters contain estimates of the probable tonnage that would be handled on the river. The total of the prospective commerce at St. Joseph, Mo., is given as 77,000 tons. The figures given by the various firms at Omaha make a total of about 50,000 tons.

TRANSFER AND TERMINAL FACILITIES.

16. No special transfer or terminal facilities exist on this stretch of river. There are simple river landings at most of the towns reached by ordinary roads. There are railroads at all of the places of importance, and transfer between rail and water could easily be arranged. There is space available for public terminals at most places.

WATER POWER, FLOODS, AND OTHER RELATED SUBJECTS.

17. There appear to be no plans for development of water power on any part of this stretch of the Missouri River. There are no rapids giving any concentration of fall, nor any bends sufficiently long and sharp to enable a large head to be obtained by carrying the water across the neck of a bend.

18. The river is subject to floods, which cause damage to the lands in the valley. Extensive overflows are not frequent. The improvement of the river by the protection of the banks would enable landowners to build levees with some assurance of permanence, and in that way would reduce the effect of floods.

[1] Not printed

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19. The loss of land by erosion is a serious matter. Much productive land is washed into the river during high stages, and some loss of this kind is going on all the time when the river is not frozen. There is a corresponding growth of land made by river deposits, but the growth is slow, while the erosion is rapid. For this reason the loss of land by erosion makes a much greater impression than the gain of land by accretion. Moreover, the gains do not equal the losses, even in theory, because some of the eroded material is carried to the mouth of the river and eventually to the Gulf of Mexico. The improvement of the river would be directly beneficial in the prevention of erosion.

COOPERATION.

20. Inquiry was made as to the possibility that cooperation in bearing the cost of improvement might be had from States, cities, associations, corporations, or private parties. In a general way there appears to be a willingness to cooperate, but it has not taken tangible form. I think it is safe to say that unless there is a radical change in the relation between the Federal Government and the local governments or other parties in interest, the cost of any extensive improvement will fall almost entirely upon the United States. If improvement were undertaken, the local interests should, and no doubt would, provide their own landings and facilities for the handling and transfer of freight.

CONCLUSION.

21. In view of the fact that the Government has embarked on the improvement of the Missouri River from Kansas City to the mouth at an estimated cost of $20,000,000, funds for which are not available in sufficient amounts for the proper prosecution of the work, and the fact that the commerce below Kansas City does not yet show or promise a development commensurate with the large expenditure involved, it seems to be premature to take up the improvement of another long stretch of the river at this time. The river above Kansas City is snagged regularly, and I think this should continue. Any work beyond this involves a greater expense than appears to be warranted by present or prospective commerce. The expenditure of money for scattered and unsystematic work is not recommended. Either the work should consist of complete and systematic protection of bank and control of channel or it should be confined to snagging.

22. For these reasons I report that in my opinion the improvement of the Missouri River from Kansas City, Kans., to the northern limits of Florence, Nebr., is not advisable to any greater extent than the continuance of snagging operations, which are carried on under existing appropriations.

HERBERT DEAKYNE,
Lieut. Col., Corps of Engineers.

[First indorsement.]

OFFICE DIVISION ENGINEER, WESTERN DIVISION,
St. Louis, Mo., May 28, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. Forwarded, concurring in the opinion of the district officer that the improvement of the Missouri River from Kansas City, Kans., to

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the northern limits of Florence, Nebr., is not advisable to any greater extent than the continuance of snagging operations, which are carried on under existing appropriations.

C. McD. TOWNSEND,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors see p. 2.]

LETTER OF BOARD OF FIRE AND WATER COMMISSIONERS.

KANSAS CITY, MO., *April 15, 1915.*

DEAR SIR: I have received your circular letter, dated the 8th instant, asking for certain information, which I am glad to furnish to the limit of my power.

In answer to your first question—the necessity of the improvement—I wish to call your department's particular attention to the fact that there is about 4 miles of the Missouri River on the Kansas side, not within the limits of Kansas City, Kans., and Clay County, Mo., on the other side of the river, to which there is no attention given in this improvement. The north line of Kansas City, Kans., on the Missouri River, is but a half mile or so above the mouth of the Kansas River, and we strike the line of Kansas City, Kans. again up the Missouri River about 5 miles at the Quindaro Pumping Station, Kansas City, Kans., having benevolently taken our water plant into their city, so as to secure more taxation out of us. Kansas City, Mo., is vitally interested in this stretch of river.

There is a good revetted bank on the Missouri side, but there is an island above the mouth of the Kaw River, and while your harbor line is on the east side of that island, the channel is more than ordinarily on the west side. Kansas City, Mo., will have to install an additional water plant before many years, as the growth of the city will require it.

While we can protect without danger in our own State, having a revetment already constructed by the Burlington on the Missouri side, we would be liable for trespass and untold litigation with the owners on the Kansas side. We dare not undertake to do this of our own volition. I hope sometime to be able to convince the engineering department and the Congress of the United States that in any scheme of improvement on the upper river above the Kaw—this piece of river should be attended to—is largely in the interests of navigation and incidentally for the benefit of Kansas City, Mo., when they are ready to install a new intake and low-service station.

In answer to your second question as to depth required, will say I know nothing of the necessity for a deep river. As an engineer, I know that the greater the depth, the greater the expenditure necessary to attain it. Therefore, if we had 4 feet below the low-water mark, about 8 feet on the river gauge, I think it is all navigation will require on the upper river. In its present condition the snag-boat service that you have been giving us is sufficient.

I think that we will develop river navigation as far as Florence, Nebr. without further improvement, except, possibly, some of those reaches and bends in the upper river, with which I am not familiar.

The present commerce on the river above Kansas City, Mo., I can not give any opinion of. I know that at present the bulk of the supplies of alum and lime, possibly 5,000 tons, that we receive, comes from the vicinity of St. Louis and the Mississippi River below St. Louis. These could be delivered at about three-quarters of the present freight rates, or better, at Quindaro Station, about 7 miles above the mouth of the Kaw without further improvement of the river, except in the vicinity of the island that I speak of about 1 mile above the mouth of the Kaw.

The Kansas City, Mo., River Navigation Co. is now delivering at the Kansas City wharf the requirements of Kansas City, Mo., in the way of filter alum (sulphate of aluminum), which we use as a coagulant in settling the mud of the Missouri River water. We have been receiving that traffic by rail from the Kansas City municipal wharf for a year, coming from the city of St. Louis on the Navigation Co.'s barges. We have been receiving lime by rail, and that comes, to the best of my knowledge, from the vicinity of Cape Girardeau on

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the lower Mississippi. The general effect on freight rates for that distance on this, would be to give a rate two-thirds to three-quarters of the ordinary freight rate, or else bring rail rates down.

There are no terminal or transfer facilities, to my knowledge, above the mouth of the Kaw, and I do not know what arrangements other cities above have or will have.

I do not believe that Congress will ever authorize the damming of the Missouri River, nor will it create any water power. It will have to depend on some device that will utilize the current flow.

As to floods, will say there have been no serious floods in the Missouri River above the mouth of the Kaw, to my memory, which goes back to 1849, and I do not find there is any history as far as I know, that there has ever been any flood in the Missouri River above the mouth of the Kaw that did any serious damage. I do not believe the improvement of the river would be of any effect except to diminish the damage from such floods when they come.

As to land reclamation, will say that I can only point to the island a mile above the mouth of the Kaw, that this land when reclaimed is just as good agricultural land as exists along the river, and if there was a channel 1,200 feet wide, the floods when they cause an overflow of the channel would be of more benefit than injury, because floods of the Missouri carry the finest fertilizer known, and there is nearly a mile lost by the river channel around that island, whereas a quarter of a mile would be ample.

I have not the authority to pledge the cooperation of Kansas City because it is beyond my power, but Kansas City will cooperate with the United States if any reasonable basis can be devised in closing that chute and giving Kansas City the only chance that I see of putting in a new water station.

I know of nothing I could add concerning the question of navigation. I only know from the past that until 1865 Kansas City depended on the river for all its traffic. I know that during the year 1858 there were one or two boats in Kansas City's harbor throughout the winter, because the winter was an unusually light one, which left the river in a fair navigable condition so that a boat could travel any time that year or the early spring of the next. I think that will be brought about again, but with the lack of interest on the part of those that have been in it and without aggressiveness the action of the navigation improvements will be very slow.

Yours, respectfully,

JOHN DONNELLY, *President.*

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF LEAVENWORTH CHAMBER OF COMMERCE.

LEAVENWORTH, KANS., *April 24, 1915.*

DEAR SIR: In reply to your inquiry of April 8, asking for certain detail information and views on the subject of river improvement, would state that it has been carefully considered and our reply is inclosed herein. I do not know that I am giving just the information you want or require, but have stated our case just as we see it.

This matter of water transportation and its effect on transportation in general has been carefully studied and we are firmly convinced that the future of cities on the Missouri River depends to a great extent on the amount of development of their water transportation facilities.

If there is any specific or definite information not covered herein, would be glad to furnish same if possible.

Yours, very truly,

LEAVENWORTH CHAMBER OF COMMERCE,
W. A. AUSTIN, *Secretary.*

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

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Necessity of improvement.—Would state in the beginning that Leavenworth is more particularly interested in the improvement of the river from this city to its mouth than in the improvement of that portion above us, but strongly favors the extension as far up as Omaha. The river as a navigable stream has been so long neglected that there are many obstacles to navigation that could easily be removed. The stream without some artificial restraint is constantly changing its channel, making navigation uncertain and precarious, and the dependable depth of water at certain points curtails the season of navigation to a great degree. The Missouri River has for 10 months in the year a sufficient flow of water to provide for practical and successful navigation if same can be controlled and kept in a permanent channel, and we believe this can be done, and the benefits to be derived from this navigation will pay for its improvement of one hundredfold, as we will attempt to show hereafter.

Depth required.—In order to conduct a successful line of boats that would be of a character and construction to make them dependable and profitable, there should be a low-water channel of not less than 6 feet. We believe that owing to the strong pressure of competition that there will be developed more or less water transportation between Kansas City and St. Joseph and possibly as far up as Omaha, but it will be severely handicapped by its not being dependable and regular. Active work is being done in promoting water navigation north of Kansas City at the present time, and we believe that an attempt will be made to operate boats within the next two or three years even without river improvement, but the hope of this improvement later will be a large factor in bringing this about.

Present commerce.—None: no boats in commercial traffic.

Prospective commerce.—This is so speculative and offers such great possibilities that it is hard to arrive at any definite figures. Leavenworth city alone at the present time uses 15 tons of pig iron daily, has flouring mills largely engaged in export business with a capacity of 2,500 barrels daily. Last year there was produced within a radius of 20 miles of Leavenworth 100,000 tons of wheat, to say nothing of the possibilities of shipments from farther west to this point and thence by river to the Gulf. As you know, the bulk of the wheat and corn from the Missouri River Valley is now exported via the Gulf of Mexico, and with the advantages of lower rates caused or induced by water transportation the entire grain produced and exported from this valley will be assembled at points on the river, and there probably will never be boats enough to handle only a fraction of it. Our sugar and general merchandise traffic from the East and South with that of the cities on the river above us will keep busy any possible boat lines if the service can be made dependable, and if rail lines meet the water rate and divide the business it will be because of the river.

Effect on freight rates.—The Missouri River as a navigable stream was the original cause of the location of Kansas City, Leavenworth, Atchison, St. Joseph, and Omaha, and was the original cause of the break in east and west bound rail rates, that has in the past helped them to grow and maintain their commercial supremacy. The Interstate Commerce Commission has always permitted rail lines to meet water competition where actual transportation existed, and the rail lines invariably do meet it when water transporation is prepared to care for any considerable portion of the traffic, as is evidenced by rail rates from the eastern seaboard to Chicago in competition with Lake rates, and to the Pacific coast competing with ocean rates. Lower rail or water rates from the Missouri River points will necessarily force a reduction in all rail rates from interior points west of the Missouri River, as the rail lines will not relinquish the long haul to the seaboard if they can avoid it, and a lower rate from the Missouri River to the Gulf will incidentally add to the price of farm products throughout the valley States at the points of production. Water rates are the controlling factor in rate making and always will be.

Terminal transfer facilities.—In speaking of terminal facilities, I can only speak of Leavenworth, as I am not acquainted with the situation in other cities. In the early days of steamboating on the Missouri River a landing place was improved to some extent, and there is to-day in the ordinary stages of water a good levee along the water front here. This is open to the use of any or all persons practically without charge. Not having any water traffic in the past there are no docks and other facilities for the handling of freight and passengers, but they can be easily and cheaply installed. The railroads, as usual, have constructed their lines along the entire water front, and it is only a matter of 100 or 200 feet of rails to connect up with any part of the levee.

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There will be no grading or other obstacles of importance, and the facilities will undoubtedly be provided by the local community when there is an opportunity to use them.

Water power.—There have been no plans outlined here for the production of water power to be derived from the Missouri River; in fact, it has always been considered that the engineering difficulties of the case would forbid the development of water power near Leavenworth.

Floods.—For a distance of 20 miles on either side of Leavenworth there is a considerable acreage of low land, part of which is now in cultivation and a considerable amount that is not, owing to the danger of overflow during periods of high water. This land could be reclaimed and become very valuable if this danger was removed. We do not understand that any system that might be adopted would increase the danger from floods, but rather the contrary.

Land reclamation.—This subject is mentioned incidentally under the head of floods, but the acreage now of little or no value, on account of the periodical overflow, is very large, and if any system could be devised to reduce this overflow the results as expressed in dollars and cents would reach a very large sum.

Cooperation by local interest.—It is only recently that the question of river improvement and river navigation has been taken up in earnest by the local communities along the river, and it has not to any great extent reached the State governments or the communities away from the river. However, the river cities are very much in earnest now in this matter and will undoubtedly be willing to cooperate in this work as far as they are able, and will furthermore ask of their State governments all the assistance they can possibly get, and undoubtedly will succeed in getting such assistance when the development of the idea of water transportation has had time to grow and the public educated to its importance.

LEAVENWORTH CHAMBER OF COMMERCE,
W. A. AUSTIN, *Secretary.*

LETTER OF ST. JOSEPH WATER CO.

ST. JOSEPH, MO., *April 21, 1915.*

DEAR SIR: Beg to acknowledge receipt of your circular letter of the 8th instant, asking our opinion as to the advisability of improving the Missouri River. Answering your inquiries in the order named; beg to give you our views on this subject and as follows;

Necessity of improvements.—Unquestionably, there is a necessity of this improvement and for the following reasons: First. By the improvement of the stream it will open same to navigation. Second. The improvement will confine the river to a fixed channel, and thereby prevent cutting into the banks, which means an increased value to the adjacent farm land. Third. The prevention of the river cutting the banks means an improved channel not only to the lower Missouri River, but also to the Mississippi River.

Depth required.—In my opinion, the depth of channel of 5 feet at standard low-water mark will be ample for navigable purposes. It is my opinion, if the river is improved making the navigation possible, at the time such improvements are completed there will be ample commerce for the water haul and also by the development of the country all the commerce the existing railroads can handle.

Present commerce.—At present there is no river commerce to speak of. This by reason of the uncertain channel and hazard of river navigation.

Prospective commerce.—It seems to me there is big field open for river commerce, as stated above, if the river is improved ample commerce will follow as surely as the day follows the night.

Effect on freight rates.—In my mind, unquestionably, the water rates would be made profitably lower than the present freight rates, but I fully believe with the development of the country adjacent to the river there will be ample trade for both water and railway.

Terminal and transfer facilities.—I am not acquainted with the terminal or landing facilities on this stretch of the river, but unquestionably with the improvement of the river there will be no trouble in landings.

Water powers.—While I believe that eventually water power will be developed on this river, by reason of the cost I do not believe that this time is propitious for such an undertaking.

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Floods.—With the improvement of the river and protection of the banks the damage at time of flood periods will be less than it is at present. I believe that the height and duration of the floods will be practically the same as it now is.

Land reclamation.—Unquestionably, with the improvement of the river, land reclamation will follow, resulting in an increased value of the land adjacent to the river.

Cooperation by local interests.—In my opinion, the Government, State, cities, and corporations and the land adjacent to the river and benefited by the river improvement should each bear a part of the expense of the improvement.

Special features.—With the improvement of the river to the extent of a good navigable channel at all seasons, there is no question, in my mind, as to providing capital being raised to establish boat and barge lines, and while there will unquestionably be a diversion of freight from existing routes to the river, as stated above, it is my opinion, by the time it is possible to improve the river for navigation, there will be ample freight for both the river and existing railroad lines.

Very truly, yours,

ST. JOSEPH WATER CO.,
By C. H. TAYLOR, *Superintendent.*

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF COMMERCE CLUB OF ST. JOSEPH, MO.

MAY 13, 1915.

DEAR SIR: With apologies for delay, which was unavoidable, we now submit answers to inquiry contained in your circular letter April 8, 1915, in the order presented:

Necessity of the improvement.—If the channel of the Missouri is placed in condition for navigation between Kansas City and St. Joseph, the shipping interests of St. Joseph would make use of same in the transportation of their merchandise and goods to and from St. Louis.

Depth required.—Our information as to required depth of channel for purpose of navigation is meager, but it is our opinion that the same depth north of Kansas City as has been secured between Kansas City and St. Louis, and which is sufficient for navigation purposes, would meet our needs. Not only should there be sufficient depth of channel, but the stream should be kept reasonably clear of snags and other obstructions as to insure reasonable navigation.

Present commerce.—There is at the present time no Missouri River traffic of consequence into or from St. Joseph.

Prospective commerce.—St. Joseph is an important manufacturing and wholesaling community, in connection with which business there is a large volume of traffic to and from St. Louis (usually originating or destined beyond St. Louis). With river transportation available an important portion of this traffic could and would be shipped by river.

Upon interviewing our more important shipping interests we have arrived at the following conservative estimate of the kind of traffic and volume of traffic which would be available to river navigation:

	Tons annually.
Dry goods	11,000
Groceries	15,000
Hardware	9,500
Confectionery manufacturers' supplies	7,000
Paper and paper stock	2,000
Flour and other grain products	2,500
Structural iron	4,000
Drugs	1,000
Miscellaneous articles	25,000
	77,000

This deals entirely with traffic which would move to or from St. Louis. Way traffic to and from points intermediate with St. Louis would be comparatively small and is difficult to estimate.

Effect on freight rates.—In our opinion the freight rates on the river would be lower than the present rail rate. The present rail rates are exceedingly

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high, and there is a wide margin of opportunity for transportation lines to handle this traffic at a profit on a materially lower basis. Rail rates are arbitrarily controlled and maintained, and it is a question, therefore, whether the establishment of river transportation would result in a reduction of the rail rates, at least until such time as river competition would be keenly realized by the rail carriers.

Terminal and transfer facilities.—At this time the dock and river terminal facilities at St. Joseph are very limited, but there is sufficient river frontage available and of ready access to city streets to provide ample river terminals.

Water power.—At this writing no water-power projects are before us.

Floods.—This community has suffered but little from floods during the past several years. However, at times there have been damaging overflows on the Kansas side, immediately opposite. It is our opinion that river improvements for purpose of navigation would reduce flood liability.

Land reclamation.—This subject is generally covered in the one preceding. Land reclamation on the Missouri side of the river would be a negligible quantity.

Cooperation by local interests.—We are without information as to what assistance might be extended by the States of Missouri or Kansas, nor have we definite views as to the assistance which the river cities, associations, corporations, or private parties might extend toward the cost of river improvements. These facts could be more readily developed upon receipt of information as to the cost of improvements and nature of same.

Special features.—The matter of establishing boat lines on the Missouri River is a subject which has had consideration on various occasions. Always, however, this project has been confronted with the unnavigable condition of the river, and must necessarily remain in abeyance until a navigable channel is assured.

That the establishment of new industries, particularly along manufacturing lines, is influenced by river service and competition is undoubtedly a fact.

The matter of the diversion of specific classes of freight from rail lines to the river is dealt with above under the subhead "Prospective commerce."

Respectfully, yours,

COMMERCE CLUB,
By H. G. KRAKE,
Manager Traffic Bureau.

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF MR. JNO. G. STEINHART.

NEBRASKA CITY, NEBR., *April 24, 1915.*

DEAR SIR: Your circular letter of April 8 duly received and fully noted. I am gratified to make a report on a subject of such interest to our section:

Two reasons can be advanced as to the "necessity of the improvement" of the Missouri River from Kansas City, Kans., to Florence, Nebr.—the desire of this section for river transportation connecting at Kansas City with the navigable portion of this stream and the need of the navigable portion for the traffic that can be developed in this section.

I am not conversant with the exact figures as to depth of channel at low water considered necessary for satisfactory navigation; am confident that the depth as found required for the lower stretch can be maintained or secured in this stretch, with a like experience as secured in your initial work. If anything, the work of securing the depth and in maintaining the same will be less than the cost of your present stretch.

The territory tributary to the stretch of river as above outlined is the most productive in all the United States. This stretch comprises the most fertile area of Missouri, Kansas, Iowa, and Nebraska. The United States census (1910) gives the above States as follows: Cereals, 1,288,000,000 bushels, valued at $700,000,000, and live stock at $1,200,000,000, or a total production of nearly two billion in value. The territory tributary to this stretch of the Missouri River is that part of the above States that contributed the major part of the production above outlined.

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The present movement of the cereal and live-stock products of this section is to the South and that part of the South that is intersected by the Missouri and Mississippi Rivers. The present movement in our State is from the west and central part to the east, points along the Missouri River, and then down to southern points and ports—cereals, live stock, hay, and other products, in bulk or manufactured. The volume and value is set forth above.

None of this goes by water; all is rail transportation.

The prospective commerce is a proper portion of the above grand total production of this section. With the river open to the Gulf a large portion would be through shipments. This section will always be a producer of a surplus, and its distribution will follow the waterways if possible.

I understand that a slight reduction in freight rates has resulted from the river traffic from Kansas City south. Surely, with the distance as an advantage, in the matter of the long haul this section would profit by some pronounced reduction in the freight rates. We have no terminal or transfer facilities at Nebraska City. In the early days our point was an active one in river traffic. The river bank used in the early sixties is still used for the few passing boats for unloading or taking on coal and supplies. A railroad track parallels this stretch of river bank; it is a public road and available to the public.

The Burlington bridge spans the river just ahead of this stretch; the location is such that mechanical appliances can be easily installed for transfer from car to boat.

There is no question but that public facilities for unloading and for transfer would be installed were the river improved.

Am advised that this river does not admit of power development.

Floods have suffered this section terrible losses. To the east there lies thousands of acres of fertile land; all has this menace of possibility of loss of crop, some of loss of land. This causes instability in values, which would be eliminated were the river defined in its channel. Many thousands of acres of land have been washed into the river in the years past. There is also thousands that can be reclaimed were proper steps taken to do so.

With this section assured of a condition that would remove the possibility of the loss of crops and of land, a remarkable increase in values would ensue.

Can not advise of cooperation of States or cities in ways financial. This must be handled in its own way. Presented with comprehensive plans, all convincing in the way of results, I feel that this section will be interested in this proposition sufficiently to do everything that is fair and right to secure the permanent improvement of this river.

Cooperation from the people of this section is assured, once the engineer's report shows the way.

We feel that this investigation should be thorough; that the territory is the most important in the United States in the point of production of farm products; that transportation is important, and if an advantage can be secured in this direction that every effort should be made now to prove out its feasibility.

Nebraska City is interested and will respond for information or assistance whenever called upon.

Respectfully,

JNO. G. STEINHART, *Postmaster.*

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF COMMERCIAL CLUB OF OMAHA.

OMAHA, NEBR., *April 19, 1915.*

DEAR SIR: In response to your circular letter of April 8, I will answer your inquiries in their order as you have outlined them:

In regard to the necessity of improvement between Kansas City and Florence. wish to say that shippers in Omaha expect to make use of the Missouri River. probably between Omaha and Kansas City, in connection with the Kansas City line, providing the survey to be made by the Army engineers shows the conditions to be favorable.

Depth required.—We understand that the Kansas City-Missouri River Navigation Co. finds that 8½-foot channel between Kansas City and East St. Louis

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has been satisfactory for navigation purposes, and we feel that 3½ feet would be ample, but that 3 feet might be sufficient. In regard to the possibility of developing commerce on the river in its present condition, we think that river shipping is possible, providing the condition is what we think it to be. Our opinion in this regard will depend very much upon the findings of your preliminary examination and survey.

Present commerce.—There is no present commerce regularly between Omaha and Kansas City on the Missouri River.

Prospective commerce.—This has been covered in the foregoing answers. The distance freight is to be carried to connect up wth the Kansas City barge line we understand to be about 260 miles. Our own plans regarding commerce are made taking Kansas City's experience as a basis.

Effect on freight rates.—Freight rates on the river would unquestionably be lower than the present railroad rates. Possibly the improvement on the river might cause a reduction on rail rates, but it is generally felt here that river navigation must be undertaken as a practical carrying proposition and not as a means of securing lower rates from railroads. We understand that in a few instances local rates from Kansas City to other river points farther down have been lowered.

Terminal and transfer facilities.—The city of Omaha owns two or three strips of ground on river front, which would be available for terminal purposes. These spaces on the river front are close to railroad trackage, and tracks could easily be laid to the water landing, making switching easy from all roads now leading into Omaha. In the event of municipal terminal here, facilities for transfer of freight from water to rail or vice versa would be contemplated. There are no transfer or terminal facilities now operated here.

Water power.—Water power is not a subject to be considered with Missouri River improvement in this section, according to the advice of those best in position to judge. The Platte, Elkhorn, or Loup Rivers might be well suited to this project, but not the Missouri.

Floods.—This locality suffers very little from floods. The damage in the last few years has been almost negligible.

Land reclamation.—It is possible that river improvement might render more valuable some of the lowland along the river which is now not built up because of the possible danger of floods, this land being very close to the wholesale and shipping district in Omaha it would be of considerable value. Just what its increase in value might amount to naturally depends upon the amount of improvement and protection might be accomplished by work on the river.

Cooperation by local interests.—It is quite impossible to forecast what assistance might be expected from States, cities, associations, or private parties regarding the cost of river improvement, inasmuch as the value of the river itself depends so much upon the showing of the examination and survey.

The foregoing answers cover in a general way the information that you seek under the heading of "special features." In case the river should be declared a stream adapted to navigation it is very likely that arrangements will be made for shipping regularly between Kansas City and Omaha. In such event the field might be open to new industries of different character and a diversion of some classes of freight from existing routes to the river would naturally follow.

Yours, very truly,

ROBT. H. MANLEY, *Commissioner.*

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF COMMERCIAL CLUB OF OMAHA.

OMAHA, NEBR., *May 10, 1915.*

DEAR SIR: The secretary of the Omaha Grain Exchange has just brought in to me the reports of that body for the past three years. He is anxious that I send them to you, so that you may have access to them in compiling your report.

I am sending these reports to you under separate cover, but for fear they might be delayed for a day in the mail I include here the items which, I think, will be of particular interest to you.

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Disposition of shipments from the Omaha market.

[Expressed in bushels.]

Destination.	Wheat.	Corn.	Oats, rye, and barley.	Total.
1912.				
St. Louis	1,125,600	184,800	588,000	1,898,400
Mississippi River points	256,600	359,700	66,500	681,800
Southeast and Mississippi Valley	270,000	948,200	1,525,000	2,743,200
Export via Gulf	2,911,200	9,900	28,500	2,949,600
1913.				
St. Louis	3,465,600	779,900	659,500	4,905,000
Mississippi River points	1,082,400	840,400	333,500	2,256,300
Southeast and Mississippi Valley	638,400	1,134,100	1,436,000	3,208,500
Export via Gulf	1,101,600	79,200	114,000	1,294,800
1914.				
St. Louis	648,000	1,651,100	1,708,500	4,007,600
Mississippi River points	831,600	530,200	2,569,500	3,931,300
Southeast and Mississippi Valley	109,200	375,100	1,305,000	1,789,300
Export via Gulf	211,600	42,900	436,800	691,300

The members of the Omaha Grain Exchange are deeply interested in the project of river navigation and feel that a 6-foot channel from Omaha to St. Louis will mean much to the residents of this section of the country in shipping out grain.

I realize that this matter is reaching you at a late hour, but I am convinced of its importance.

Yours, very truly,

ROBERT H. MANLEY, *Commissioner.*

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF L. G. DOUP CO.

OMAHA, NEBR., *May 7, 1915.*

DEAR SIR: We are asked to advise you as to the amount of freight we have which would be available for Missouri River transportation. Our purchases of cotton piece goods originating in Georgia amounts to many tons in weight, while our consumption of cotton and cotton linters is about 2,000 bales per year. The weight on a bale of this product is about 500 pounds, and would be very much to our interest to have the advantage of river transportation.

Yours, very truly,

L. G. DOUP CO.,
L. G. DOUP, *President.*

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF WALRATH & SHERWOOD LUMBER CO.

OMAHA, NEBR., *May 7, 1915.*

DEAR SIR: Permit us to urge upon you how vitally interested the jobbers and shippers of Omaha are in the development of the Missouri River for navigation.

Just what tonnage will move via this waterway when once developed we do not undertake to say. Doubtless you are in a position to determine. Speaking for this concern, we ship about 400 carloads of lumber annually, all of which move either through the St. Louis or Kansas City gateways, and at least the greater portion, if not all of same, would be available for water transportation were it possible.

The shippers and jobbers of this locality are a unit as to the desirability of this development, and believing such development to be entirely feasible as an

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engineering proposition, we would bespeak such influence as you could exert toward accomplishing this.

Very truly, yours,

WALRATH & SHERWOOD LUMBER CO.,
By C. H. WALRATH, *Treasurer.*

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF BAKER ICE MACHINE CO.

OMAHA, NEBR., *May 7, 1915.*

DEAR SIR: We are pleased to say we have just been informed that the preliminary examination of the Missouri River has been made between Kansas City and Florence for the survey as contemplated by act of Congress. We are of the opinion that if this improvement is made and the river made navigable that the results will be far more than the present expectation from such a source, and will be of great value to shippers to be reached by this line. In our particular case we believe our business will amount to from 50 to 75 carloads a year, and probably more. and we know that many other manufacturers will be very glad to see this improvement made, as it will mean a great deal to all points along the river. We sincerely hope that Congress will grant this privilege and proceed at once to make the river navigable.

Very respectfully, yours,

BAKER ICE MACHINE CO.,
Per J. L. BAKER, *President.*

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF OMAHA MANUFACTURERS' ASSOCIATION.

OMAHA, NEBR., *May 7, 1915.*

DEAR SIR: So far as we have been able to determine, and we have made a pretty thorough canvass, we believe that Omaha shippers are anxious to see river freighting made possible by providing an adequate river channel.

We have approximately 50,000 pounds of freight a month coming through St. Louis and Kansas City that would be available for river shipment. We have outgoing freight of from 2,000 to 4,000 pounds a week that we believe we could ship very conveniently by boat line.

In a conversation recently with a number of millers from various points in Nebraska, assembled in Omaha at annual convention, we learned that they would be greatly benefited by river transportation and that they are unanimously in favor of the same.

Very respectfully,

JOHN W. GAMBLE.

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF CARPENTER PAPER CO.

OMAHA, NEBR., *May 7, 1915.*

DEAR SIR: We understand that you are about to issue a report in regard to your investigation of the Missouri River from Omaha to Kansas City. This company is very much interested in the shipping of freight by water. We could ship probably 1,000 tons of freight by water per year if suitable facilities were arranged for.

We also are affiliated very closely with a house at Kansas City. It might be possible to even make that tonnage much greater. We are only mentioning a portion of our tonnage, because some of it would have to come on rail where

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there would be no transferring. We would only ship by water where there would be no material harm to the goods.

We have become quite interested in river navigation from the study of exhaustive uses it is made of in foreign countries, and we sincerely hope that your report will be such that the Government officials will see the great necessity for river navigation in order to reach a complete development of this section of the country.

Yours, truly,

CARPENTER PAPER CO.,
ARCHIE W. CARPENTER, *Treasurer.*

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF THE JERPE COMMISSION CO. (INC.).

OMAHA, NEBR., *May 7, 1915.*

DEAR SIR: We are very much interested in Missouri River navigation, and wish to say that we are very eager to see river freighting made possible by providing an adequate river channel.

We are shipping a lot of goods to St. Louis and Kansas City, and can readily see where it would benefit our company, as well as the public at large.

We wish to impress upon you the necessity for this, and trust that you can see it our way and recommend it.

Thanking you in advance, we remain,

Yours, respectfully,

THE JERPE COMMISSION CO.,
C. A. SWANSON.

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF BAKER MANUFACTURING CO.

OMAHA, NEBR., *May 7, 1915.*

DEAR SIR: We are advised that the preliminary examination made by your engineers of the Missouri River from Kansas City to Florence, Nebr., indicates the feasibility, as an engineering project, of the making of a channel in this river for navigation purposes.

As one of the wholesale houses and shippers in this territory, we are very anxious that this proposition may be consummated. It is a matter of vast importance to the shippers and consumers in a large territory tributary to the distributing centers along the river. There is a vast amount of freight which could be handled much more cheaply into these distributing points by water route. A large portion of our business is in pipe, which is principally shipped from Pittsburgh, or, if not shipped from Pittsburgh, is charged for on the basis of Pittsburgh freight. There is doubtless not less than 10,000 tons of pipe handled through Omaha annually, and this undoubtedly could be delivered here much more cheaply by water, down the Ohio and up the Missouri, than by the all-rail route.

If we can be of any assistance to you in giving you further information in regard to shipping which could be handled to advantage by water into this market we will be very glad to do so.

Hoping that you will find it possible to urge the improvement of this stretch of the river, we are,

Very truly, yours,

BAKER MANUFACTURING CO.,
By H. J. BAILEY.

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

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LETTER OF PAXTON & VIERLING IRON WORKS.

OMAHA, NEBR., *May 7, 1915.*

DEAR SIR: We believe that all the Omaha jobbers are eager to see the river freighting made possible by providing adequate river channel. In our particular line of business we would have approximately 2,000 tons of freight moving up the river, which would consist of pig iron, bar iron, and bolts. This material would come from Kansas City and St. Louis.

Wishing you success in the undertaking,

Yours, very truly,

PAXTON & VIERLING IRON WORKS.
F. R. VIERLING, *Assistant Manager.*

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF UNCLE SAM BREAKFAST FOOD CO.

OMAHA, NEBR., *May 7, 1915.*

DEAR SIR: We are just in receipt of a communication from the Commercial Club of Omaha requesting us to advise you direct, not later than May 8, approximately the amount of freight which we may have coming through St. Louis or Kansas City to Omaha, or vice versa, that might be available for river shipment. Owing to the shortness of time, it will be impossible for us to give you the accurate figures, but we might say that, while we have no freight coming into Omaha through these towns, we do have a large quantity that could be routed that way. We ship in carload lots of 20,000 pounds regularly once a month to Columbus, Ohio, twice a month to New York City, and in less than carload shipments, about 5,000 pounds, monthly to Kansas City and 2,000 pounds monthly to St. Louis.

While all of our trade in the South is routed through either of these two cities, we might say, in round numbers, that we would have between 40 and 50 tons monthly that could be handled by river.

We trust that this is the information desired. If there is anything further on this matter that we could furnish you, please call on us at any time.

Yours, very truly,

UNCLE SAM BREAKFAST FOOD CO.,
C. E. BARRY.

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF CARTER SHEET METAL CO.

OMAHA, NEBR., *May 7, 1915.*

DEAR SIR: At the request of the river navigation committee of our Commercial Club we are writing you. We are one firm among many here in Omaha who are very anxious to see freighting made possible on the Missouri, and believe that it would be a paying proposition. We have all the way from 15 to 20 carloads a year which come to us through Kansas City and St. Louis, and they average about 40,000 pounds to the car. Then, too, we might be able to use this means for some of our outgoing shipments.

As we say above, we are heartily in favor of river navigation.

Very truly, yours,

CARTER SHEET METAL CO.,
R. L. CARTER.

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

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LETTER OF COLE & FRY CO.

OMAHA, NEBR., *May 7, 1915.*

DEAR SIR: Being interested in the development of the Missouri River for navigation purposes we desire to emphasize that fact that we believe and hope that this may become a reality, and that it will be of great benefit to the people and to the business men, manufacturers—in fact, to everybody, if such can be brought about.

The writer has been in quite close touch with the situation. As you will observe, he is connected with the Commercial Club of Omaha. He is not, however, able to say that he would be able to use it in his own individual business, as it is of such a nature that a large percentage of it of necessity must be transported by express, being of a perishable nature, as you will observe from the letterhead. However, the general good to the business men and to the producers, we believe, would be very material, and we are heartily in favor of it. We believe there is not a greater thing could be done for the benefit of the people as a whole, in this and surrounding territory, as they are certainly in need of assistance and relief in matter of transportation.

We write simply to give you our views from an unprejudiced standpoint, and assure you of our hearty cooperation in every way that is possible.

Yours, very truly,

COLE & FRY CO.,
Per THOS. A. FRY, *President.*

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF H. J. HUGHES CO.

OMAHA, NEBR., *May 8, 1915.*

DEAR SIR: We beg to call your attention to our very pressing need for river navigation to this point. We are being hampered in a great many ways on account of much more reasonable rates being granted to Chicago and St. Louis which causes our competitive conditions to be much more restricted and places us in a very unfavorable position, due to the fact that we do not have a rate on merchandise based on water. We have a great deal of coffee coming up from New Orleans and out from New York, which we could have diverted to boat line at St. Louis. Also a great many canned goods from Baltimore, Ohio, Indiana, which we could have placed on the boat at St. Louis. As near as we can estimate to-day we have about 8 to 10 cars per month which could be brought in this way, enabling us to give our customers merchandise at lower prices and in line with what the consumer can afford to pay.

River navigation would also be of benefit to us in giving us a water outlet to the Gulf for grains from Omaha.

Hoping our appeal may have your closest consideration, we are,

Yours, truly,

H. J. HUGHES CO.
FRANK H. HUGHES.

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF DAVID COLE CREAMERY CO.

OMAHA, NEBR., *May 8, 1915.*

DEAR SIR: We have been requested to present to you the fact as to whether river transportation would be of benefit to our business.

We make in this plant over 250 carloads of creamery butter per annum. Our tubs all come from Kansas City or south thereof. Our egg cases come from Arkansas. These two items could very readily come by river transportation, and we are very anxious to see something of the kind inaugurated.

Very truly,

DAVID COLE CREAMERY CO.,
DAVID COLE, *President.*

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

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LETTER OF M. E. SMITH & CO.

OMAHA, NEBR., *May 8, 1915.*

DEAR SIR: We are advised that you have asked for an expression from Omaha ıippers regarding the use of the Missouri River for transporting shipments om the South and East to Omaha.

During the season of navigation we could move about 5,000,000 pounds of iscellaneous dry goods and cotton piece goods originating in New England ıd Middle States and southeast and Carolina territories, provided the water ırriers published lower than all-rail rates.

At the present time our competitors at Kansas City and St. Joseph, Mo., are ıing the service of the Kansas City-Missouri River Navigation Co. steamers om St. Louis and find it very satisfactory, as the saving effected account of fference in freight rates makes this transportation very attractive and de-rable.

We, therefore, sincerely trust that the proposed Missouri River improvements ill be accomplished at an early date that this service may be extended to maha.

Yours, respectfully,

M. E. SMITH & CO.,
E. C. WILBUR.

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF OMAHA CROCKERY CO.

OMAHA, NEBR., *May 8, 1915.*

DEAR SIR: We, Omaha jobbers, are very anxious to have the Missouri River ıade navigable. We have been informed that the preliminary examination of he Missouri River has been made between Kansas City and Florence. As you re about to make this report, we trust you will do everything possible to make t feasible.

We ship a great deal of our ware as far south as St. Louis, and we are confi-ent that this would be of benefit to our business. In looking up our records ve find that we shipped in the neighborhood of $80,000 worth south, of which 75,000 could be shipped this way.

While we are confident that our class of merchandise, which is breakable. vill be handled to a great deal better advantage by water than by rail, we trust ou will do everything in your power to see that the Omaha shippers may eceive their freight via the Missouri River and that they provide an adequate iver channel.

We remain,
Respectfully, yours,

OMAHA CROCKERY CO.,
GEO. H. MILLER, *General Manager.*

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF MCCORD-BRADY CO., GROCERS.

OMAHA, NEBR., *May 8, 1915.*

DEAR SIR: We are advised by the Commercial Club of this city that you are ıbout ready to make a report of the condition of the river between Kansas City ınd Florence, Nebr., and we understand that this report will declare it feasible from an engineering standpoint.

The Government will wish to know, of course, whether or not in case im-provements are made the river would be used for the carrying of merchandise. It is a very difficult question to answer from our standpoint. We have been without river transportation for so many years it will take some time to get back into the habit of shipping by boat. If there were a freight line established

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between St. Louis and Omaha there is no question but what we could use it to great advantage. There are many items in our line that could be carried to advantage. No doubt the river could be used in carrying California products that come around through the canal by way of New Orleans.

We certainly feel that the improvement of the river that would enable boats to carry freight from St. Louis to Omaha would be a great advantage to the business community.

Yours, very truly,

McCORD-BRADY CO.,
JNO. S. BRADY, *Vice President.*

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF H. F. CADY LUMBER CO.

OMAHA, NEBR., *May 8, 1915.*

DEAR SIR: I am a member of the Missouri River navigation committee of the Omaha Commercial Club, and I am very much interested in the navigation of the Missouri River between Kansas City and Omaha, because I feel that the future success and growth of my company will depend upon the navigation of the Missouri River to Omaha.

Coincident with the use of the Panama Canal will come very much lower rates on fir lumber from Washington and Oregon mills to every point that can be reached by water in this district—notably, St. Louis, Kansas City, Burlington and Davenport, Iowa.

Rough fir lumber weighs 3,300 pounds per M feet and surfaced fir weighs 2,400 pounds per M feet, which at a 50-cent rate costs in freight along $16.50 per M feet on rough and $12.50 per M feet on surfaced lumber to transport by railroad to Omaha from Washington and Oregon points.

The present rate on either rough or surfaced lumber from Washington and Oregon points to New York, Philadelphia, or Baltimore is $7.50 to $8 per M feet, freight and canal charges inclusive. No doubt the freight to St. Louis, Davenport, or Kansas City will be practically the same, with 50 cents to $1 per M feet added for lighterage, etc.

This would enable towns having water connection, such as those named, to outsell the Omaha lumber merchant. This is an alarming prospect for us to face in the near future at Omaha.

We sell about as much lumber in Iowa as in Nebraska, and we are informed that Davenport is expending large sums on municipal dockage to care for an immense extension of her river business.

We also handle nails and barbed wire that should come to Omaha via the water route.

We face a constant demand and the most energetic efforts by all railroads to increase our present rates on everything and are forced to employ the best of attorneys and traffic officials to maintain a small space on the map, and these same railroads have seemingly convinced our Interstate Commerce Commission that they not only do not get enough freight to make any money, but testify that an increase in their freight rates is necessary and must come if they expect to continue in business without going through the receiver's hands. So we can not expect any lower reductions in freights at their hands, and it seems to the poor business man in Omaha as if river navigation from St. Louis and Kansas City held the only possible salvation of our mercantile prosperity as a lumber market.

We receive at the present time about 200 cars of fir lumber, practically 6,000 tons, 600 cars of yellow pine and cypress lumber from the South, about 18,000 tons, 400 tons of barbed wire and nails, and we hope that vigorous action upon the part of the Government will be taken promptly to prevent a great loss to Omaha, a city that is so located geographically that it is destined as a gateway for an enormous tonnage, but for a reaction that transportation given to Omaha's neighbors and denied her would occasion.

If the Missouri River is made navigable we will certainly take advantage of it in every possible way at all times, from the first minute that it becomes available.

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I wish I could voice my extreme interest in this matter and bond my support for all time to this movement to save us from the enemy—our competitors.

Yours very truly,

H. F. CADY LUMBER CO.,
Per J. S. WHITE, *President.*

Lieut. Col. HERBERT DEAKYNE,
Corps of Engineers.

LETTER OF COMMERCE CLUB OF ST. JOSEPH, MO.

JUNE 19, 1915.

GENTLEMEN: We are in receipt of a communication, dated May 27, 1915, from Lieut. Col. Deakyne, stating that an unfavorable report has been submitted as to the improvement of the Missouri River from Kansas City, Kans., to the northern limits of Florence, Nebr., and that any objections to this report should be made to your honorable body.

We respectfully file the following objections to this report:

First. The fact that there is no extensive river traffic at present does not lessen the immediate necessity of the proposed improvements.

The purposes of the river improvement contemplated, in our opinion, are not primarily to provide for existing river traffic, but (1) to create river conditions which will make possible the gradual resumption of river traffic from Kansas City north on the Missouri River; (2) to conserve for the future the possibility of a navigable channel.

Second. The resumption of river traffic is assured as soon as river and channel conditions are improved. It will be of a gradual but certain growth.

The facts which warrant this conclusion may be summarized as follows:

(1) The river traffic which flourished 30 to 50 years ago was discontinued (*a*) because of the dangers of an unprotected channel; (*b*) and because of railroad traffic conditions which at that time were unfavorable to river traffic.

(2) The second of these difficulties is now practically removed, and the necessity of a resumption of river traffic is being made more apparent each year. It is necessary for the economic handling of certain classes of freight and will be of great benefit to shippers and consumers.

(3) The Kansas City boat line, despite incomplete channel protection, has proven its necessity and commercial value. It is operated at lower rates, as compared with parallel railroad traffic.

(4) Due to general conditions and particularly to better mechanical improvements as applied to river transportation, the commercial practicability of Missouri River traffic is annually increasing. For example, terminal connections are now better and more readily applicable to river traffic; shipments are being made in larger quantities; the opening of the Erie Barge Canal and resumption of Mississippi River traffic offers connecting river carriers; the operating cost of river traffic, as compared to rail traffic, is being reduced.

Third. The appellants respectfully suggest that to place the Missouri River navigation or any part of it on a practical basis, it will be necessary to open the traffic along the entire length of the navigable part of the river.

If this is not done: (1) The communities located north of Kansas City will be at a commercial and traffic disadvantage with river cities to the south. (2) There will be lacking the volume of traffic necessary to make the navigation of any part of the river a complete success, as a large part of such traffic must be drawn from the upper Missouri Valley gateways.

Fourth. The city of St. Joseph has traffic in bulk and in smaller quantities to and from St. Louis alone aggregating annually 77,000 tons, which is awaiting the resumption of the Missouri River traffic.

In our report of May 13, 1915 to Lieut. Col. Deakyne, it was fully brought out that this traffic could be handled with a substantial decreased cost via Missouri River boat lines. (A copy of the report [1] is attached hereto.)

Fifth. Your appellants respectfully suggest that, for reasons above outlined, no commerce upon the Missouri River above or below Kansas City can assume any large proportions until the entire channel is protected; and no proportions whatever on any part of the river which has not had at least partial protection of the channel.

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[1] See p. 14.

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In short, the commerce upon this river can be built up only following channel protection, and if the policy of the Government is to withhold such protection until commerce develops it is equivalent to stating that this river shall have no commerce whatsoever.

Sixth. The navigation of the Missouri River is and always has been an asset of Missouri and of all Missouri River States. The navigation of the river (under proper channel conditions) is an established historical fact.

The Platt purchase of 1836 was primarily induced for the purpose of making possible Missouri River navigation north of Kansas City. ("To receive their supplies and ship their productions within a moderate distance from the homes of those inhabitants." See letter of Senator L. F. Linn to H. Ellsworth, 1835.)

Seventh. The Government can not in justice require private persons to operate boats on the Missouri River at a loss as a condition precedent to Government protection of the channel.

For these reasons we respectfully appeal from this report and request:

(1) That besides the continuance of the improvement below Kansas City steps be taken to make such definite improvements (now under consideration) in the upper river as will permit of the resumption of Missouri River traffic.

(2) That such future program be outlined by your honorable body as will insure final and complete protection of the upper river for traffic purposes and will permit of the speedy development of all Missouri River traffic.

Very truly, yours,

COMMERCE CLUB OF ST. JOSEPH, MO.,
By WM. E. SPRATT, *President.*

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

LETTER OF COMMERCIAL CLUB OF OMAHA.

OMAHA, NEBR., *June 22, 1915.*

GENTLEMEN: The Commercial Club of Omaha wishes respectfully to protest against the unfavorable report submitted by Lieut. Col. Deakyne, submitted May, 1915, on the survey of the Missouri River from Kansas City, Kans., to the northern limits of Florence, Nebr. In support of our contention that the survey of the Missouri River from Kansas City, Kans., to the northern limits of Florence, Nebr., should be undertaken, we refer to:

First. The act of the Sixty-third Congress (H. R. 20189), known as the river and harbor bill.

Second. The report of the preliminary survey of this project by Lieut. Col. Herbert Deakyne, submitted May, 1915.

The Sixty-third Congress authorized the preliminary survey of the Missouri River between Kansas City and Florence. There is no justification for any assumption that Congress, having directed the Secretary of War to conduct this survey, will fail to provide the money needed to carry out river improvement. Failure of the last Congress to provide all the money recommended to carry out certain other river-improvement projects can not justly be advanced as a reason for an unfavorable report on a different project upon the financing of which the next Congress would be called upon to determine.

With the exception of its recommendation the Commercial Club of Omaha regards the report of Lieut. Col. Deakyne as favorable to the survey of this middle stretch of river. This report of preliminary examination does not state that the project is not feasible from an engineering standpoint, does not state that the shippers along the river are indifferent in their attitude toward river freighting, and does not state that great productive section of this country served by this stretch of the Missouri River would fail to enjoy great benefits from an improved river, making river freighting possible.

The basis of the unfavorable recommendation rests mainly upon unsatisfactory results during the few years time following expenditure on improvements along the Missouri River between Kansas City and the mouth and upon unsatisfactory shipping on the Mississippi River between the mouth of the Ohio and the mouth of the Missouri.

In answer to these arguments we respectfully remind your honorable board that the operations on the lower Missouri have been of but a few years' duration, that the failure to carry more freight by water has been due to a great extent to insufficient river improvement and fact that it takes some years to popularize river shipping among the shippers themselves. This year, for the

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first time, the Kansas City-Missouri River Navigation Co. has had more freight offered it than it has been enabled to handle with its present equipment. The Kansas City-Missouri River Navigation Co. has always been handicapped in that no portion of the river north of Kansas City was being navigated.

The small volume of freight on the Mississippi between the mouth of the Ohio and mouth of the Missouri seems certain to be increased, by reason of the act of the last Illinois Legislature, financing a stretch of waterway from Lockport to Utica, and thereby making possible a practical Lakes-to-the-Gulf water route.

You are certainly aware of the growing determination manifested by many Mississippi River points to revive river freighting in order to cope with the rate situation that results from the opening of the Panama Canal.

We believe that channel improvement on the Missouri should not be regarded as a financial venture in which enough shipping should be demanded within the first few years to justify the Government expenditure. The channel should be improved to enable the thousands of people in the country adjacent to the Missouri River to experience the benefits that come to communities by reason of the opening of a cheaper means of transportation. When a necessity so obvious and so grave is to be met by the Government, the people so benefitted should not be forced to meet some arbitrary requirement in the way of freight volume to prove their rights to the permanent benefits that come of the opening to traffic of the only United States Government-owned highways.

The Missouri River in its present undeveloped state does severe damage to property abutting the river. River improvement as sought for would not only protect further serious damage to property, but would reclaim thousands of acres of valuable land and render agriculture safer and more productive in the sections adjoining the middle stretch of the stream.

It would be more consistent to compare the cost of river improvement to the value of reclaimed land than to compare this cost to the volume of the immediate freight movement by water. When both purposes are served, both advantages should be taken into account.

Thousands of tons of freight annually await an improved river to make possible a shipment by water from Omaha to Kansas City and St. Louis. The shipment report of grain from the Omaha market in 1914 to St. Louis, Mississippi River points, Mississippi Valley points and export via Gulf totaled 10,419,500 bushels.

Since the passage of the river and harbor bill by Congress, the Commercial Club of Omaha has cooperated with the people of Decatur, Nebr., in securing a power boat and 50-ton barge, which will be operated throughout the summer, making weekly round trips between Decatur and Omaha. The power boat and barge, in charge of Capt. W. B. Stevens, of Glasgow, Mo., is now in Omaha, having brought 10 tons of freight from Kansas City on the stretch of improved river to Omaha.

The captain risked his boat and the shippers risked their freight in the stretch of river in order that their purpose might be accomplished. The regular trips between Omaha and Decatur will be undertaken to meet a definite demand. The boat trips are not made with any intention of demonstrating the navigability of the river or of proving the need for river improvement. The idea is to serve the thousands of people in this section by making possible means of cheaper freight hauling. That this will entail a considerable loss to those directly interested is certain.

The Commercial Club of this city and the business men of Decatur are financing the project. The condition of the river handicaps the transportation of freight, but the need of river navigation is so apparent that citizens are willing to assume the burden in order that the populous section adjoining the river between Omaha and Decatur may profit by this service. It is our conviction that a few private citizens should not bear the expense of service to a whole community, when river improvement financed by the Federal Government would make navigation self-supporting. With an improved river channel between Kansas City and Florence this section of river could and would be profitably navigated.

Yours, respectfully,

COMMERCIAL CLUB OF OMAHA,
JOHN L. MCCAGUE, *President.*

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 426.

FLETCHER BAY, WASH.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF FLETCHER BAY, WASH.

DECEMBER 17, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 16, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, of this date, together with copy of a report from Lieut. Col. J. B. Cavanaugh, Corps of Engineers, dated August 16, 1915, on preliminary examination of Fletcher Bay, Wash., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 16, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Fletcher Bay, Wash.

1. There is submitted herewith for transmission to Congress report dated August 16, 1915, by Lieut. Col. J. B. Cavanaugh, Corps of Engineers, on preliminary examination authorized by the river and harbor act approved March 4, 1915, of Fletcher Bay, Wash.

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2. Fletcher Bay is a small inlet on the westerly side of Bainbridge Island in Puget Sound. It is about 3,000 feet long, with a maximum width of 600 feet. The entrance is contracted by a spit leaving a channel less than 100 feet wide, in which there is no water at low tide. Inside the bay there is a limited anchorage at low tide for small boats, while boats drawing as much as 8 feet can enter at times of high water. No commercial use is made of Fletcher Bay, the steamboat wharf being on Puget Sound near the entrance to bay. The improvement apparently desired is the dredging of a channel through the bar at the entrance so as to permit small boats to enter at all stages of the tide. The district officer states that this work would reduce the low-water depth in the anchorage and would be of doubtful value. There is no commercial necessity for the improvement desired, and he is of opinion that it is not worthy of being undertaken by the United States. In this opinion the division engineer concurs.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith dated October 12, 1915, concurring in the views of the district officer and division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Fletcher Bay, Wash., is not deemed advisable at the present time.

DAN C. KINGMAN,
Chief of Engineers, U. S. Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
October 12, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. The following is in review of the district officer's report on preliminary examination of Fletcher Bay, Wash., submitted under authority of the act of March 4, 1915.

2. Fletcher Bay is a small inlet of Puget Sound, 20 miles from Seattle. It is about 3,000 feet long with a maximum width of 600 feet and a minimum width of 100 feet at the entrance. The low water line of Puget Sound lies entirely outside the entrance, which is dry at low water. The mean range of tide is 8.3 feet with a maximum of about 20 feet. The improvement desired is the dredging of a channel through the bar at the entrance.

3. No commercial use is made of the bay, and the district officer states that the needs of commerce can be met by the wharves near by on Puget Sound. He reports the improvement as unworthy of being undertaken by the United States, and the division engineer concurs in this view.

4. Interested parties were informed of the unfavorable report of the district officer and given an opportunity of submitting arguments

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and statements to the board, but no communications on the subject have been received.

5. It appears that the present and reasonably prospective needs of commerce are satisfactorily cared for by existing facilities, and that the improvement desired would be of little or no benefit to general commerce and navigation. The board therefore concurs with the district officer and the division engineer, and reports that in its opinion it is not advisable for the United States to undertake the improvement of Fletcher Bay, Wash.

6. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other related subjects which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

For the board.

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

PRELIMINARY EXAMINATION OF FLETCHER BAY, WASH.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Seattle, Wash., August 16, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Preliminary examination of Fletcher Bay, Wash.

1. In compliance with section 15, river and harbor act of March 4, 1915, and instructions contained in your letter of March 15, 1915, the following report, with map,[1] is submitted on a preliminary examination of Fletcher Bay, Wash.

2. No previous examination has been made of this locality.

3. Fletcher Bay is a small inlet of Puget Sound on the west side of Bainbridge Island, 20 miles from Seattle by water. It is about 3,000 feet long, with a maximum width of 600 feet near the entrance, narrowing to 200 feet at the upper end. The entrance is contracted by a spit making out from the south side, leaving a channel less than 100 feet wide. There is no water in the channel entrance at low tide, the low-water line of Puget Sound lying entirely outside the bay, 300 feet from the spit.

4. The bar, or continuation of the spit, serves to retain the water in the bay, and there is at present a limited anchorage inside at low tide for small boats. The mean tidal variation is 8.3 feet, with a maximum range of approximately 20 feet. Boats drawing as much as 8 feet can enter the bay at times of high water.

5. The west side of Bainbridge Island is a summer resort. No commercial use is made of Fletcher Bay, communication being maintained with Seattle by daily boats making regular stops at the wharf near the entrance to the bay.

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[1] Not printed.

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6. The improvement desired is the dredging of a channel through the bar at the entrance so as to permit small boats to enter at all stages of the tide.

7. The proposed cut, while allowing boats of greater draft to enter at high water, would correspondingly reduce the area and depths of the basin at low water, and would be of doubtful value to the bay.

8. As no commercial use is made of Fletcher Bay at present, and the commerce of the locality can be cared for by the wharves on Puget Sound as heretofore, there is no commercial necessity for the improvement desired, and it is not one worthy of being undertaken by the United States.

9. In compliance with law, I have to report also that it is not practicable to coordinate with any improvement of Fletcher Bay either flood protection or the development and utilization of water power for commercial purposes so as to reduce the cost of improvement.

J. B. CAVANAUGH,
Lieut. Col., Corps of Engineers.

[First indorsement.]

U. S. ENGINEER OFFICE, NORTHERN PACIFIC DIVISION,
Portland, Oreg., August 21, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. Forwarded.

2. The division engineer concurs in the views and recommendations as expressed in paragraph 8.

CHAS. L. POTTER,
Lieut. Col., Corps of Engineers,
Division Engineer.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 427.

WABASH RIVER, LOCK AND DAM AT GRAND RAPIDS, IND. AND ILL.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON REEXAMINATION OF PROJECT FOR OPERATING AND CARE OF THE LOCK AND DAM AT GRAND RAPIDS, WABASH RIVER, IND. AND ILL.

DECEMBER 17, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 16, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated August 11, 1915, together with copies of reports from Maj. J. C. Oakes, Corps of Engineers, and the Board of Engineers for Rivers and Harbors, dated July 3, 1915, and July 27, 1915, on reexamination of Wabash River, lock and dam at Grand Rapids, Ind. and Ill., made in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, August 11, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Reexamination of Wabash River, Lock and Dam at Grand Rapids, Ind. and Ill.

1. Under authority contained in section 14 of the river and harbor act approved March 4, 1915, there are submitted herewith for trans-

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mission to Congress report dated July 3, 1915, by Maj. J. C. Oakes, Corps of Engineers, and report dated July 27, 1915, by the Board of Engineers for Rivers and Harbors, relative to the project for operating and care of lock and dam at Grand Rapids, Wabash River.

2. This lock and dam were originally constructed by a private corporation and were purchased by the United States in 1874, and reconstructed between 1887 and 1894. The total cost to the Government to June 30, 1915, including operating and care, has been approximately $351,335.12. The cost of operation during the last 10 years has averaged $5,673.20 per year. The district officer states that the dam is deteriorating rapidly and must soon be repaired if it is to be maintained. New lock gates will also be required if the lock is to continue in operation. The commerce using the lock is very small, amounting in 1914 to 187 tons, and in the first six months of 1915 to 42 tons, valued at $4,290. The boats in use are merely small motor boats, rowboats, and skiffs, mostly used for pleasure. The question of the canalization of this river as far as Terre Haute has been heretofore considered and reported as inadvisable in view of the great cost involved. The district officer is unable to see any advantage to the United States in continuing to operate the isolated lock at Grand Rapids, and he recommends that a breach at least 500 feet long be made in the dam and that the operation of the lock cease. The division engineer and the Board of Engineers for Rivers and Harbors concur with the district officer in the opinion that the project should be discontinued.

3. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore recommend legislation authorizing the abandonment of the project for operating and care of the lock and dam at Grand Rapids, Wabash River, and an appropriation of $10,000 to remove a section of the dam, this work being deemed advisable in order that navigation will not be entirely obstructed at this point, and to remove and store the movable parts of the operating machinery, such as valves, gate-operating mechanism, etc.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
July 27, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. This report on the Wabash River is submitted under authority of that portion of section 14 of the act of March 4, 1915, which reads "and the Chief of Engineers is directed to make a report upon any other projects, river or harbor, the further improvement of which under present conditions is undesirable, or in which modifications of the plans or projects should be made."

2. The only project for the improvement of the Wabash River is for the operation and care of the lock and dam built during the

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period 1887–1894, at Grand Rapids, 2½ miles above Mount Carmel, Ill. To June 30, 1914, these structures have cost $351,335.12. Operation and care are now costing about $5,600 per year, and the district officer states that if the work is to be continued heavier expenses for repairs and renewals will be required in the near future.

3. The commerce has never exceeded about 2,000 tons a year, while for 1914 it is reported as 187 tons, and for the first six months of 1915 as 42 tons. This commerce is confined to the pool formed by the dam which covers a reach about 12 miles in extent. The river is practically unnavigable both above and below this short reach, therefore there is no prospect of an increase in commerce.

4. The district officer reports that he can not see any advantage to the United States in continuing to operate this lock and maintain the dam. He recommends that a breach be made in the dam at least 500 feet long and that work then cease. He estimates the cost of making the breach at $10,000. The division engineer concurs generally with the district officer, but deems it desirable to reduce the cost of making the opening in the dam.

5. The question of improving the Wabash River for useful navigation was given careful consideration under authority of the act of July 25, 1912. After an extensive survey of the river and valley, it was reported (H. Doc. No. 1001, 53d Cong., 2d sess.) that the only effective improvement would be by locks and dams at a cost of approximately $8,000,000, and that the benefits to be expected were not sufficient to justify the expenditure of that amount. Therefore there is no prospect of any through navigation and consequently of any commerce, except that existing in the short pool. This is now costing the United States about $25 to $50 per ton, with the probability that it will be more in the future if the project for care and maintenance is continued.

6. In view of these conditions it seems clear to the board that commensurate returns can not be expected from the expenditures necessary to keep up this work. It concurs with the district officer and the division engineer in the opinion that the project should be discontinued, and it recommends legislation with this end in view, and an appropriation of $10,000 to remove a section of the dam.

For the board:

W. M. Black,
Colonel, Corps of Engineers,
Senior Member of the Board.

REEXAMINATION OF WABASH RIVER, LOCK AND DAM AT GRAND RAPIDS, IND. AND ILL.

War Department,
United States Engineer Office,
Louisville, Ky., July 3, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
(Through the Division Engineer.)
Subject: Report on project for operating and care of lock and dam at Grand Rapids, Wabash River.

1. The following report is submitted in accordance with instructions contained in the fourth indorsement on letter from this office,

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dated March 9, 1915, in which I recommended that "the question of removing the dam or maintaining same be investigated in order that data may be obtained on cost of maintaining same for the next 20 or 25 years, the cost of removing the dam, and the effect of its removal on the small existing commerce."

2. For description of the physical characteristics of the Wabash River, resources, commerce, etc., see "Preliminary examination and survey of Wabash River," published in House Document No. 1001, Sixty-third Congress, second session.

3. The lock and dam in question are located at a natural falls in the Wabash River, known as Grand Rapids, 97.1 miles from the mouth of the stream and 2½ miles above Mount Carmel, Ill. This place had originally been a complete bar to navigation except at high stages of the river, being a rock bar with a fall of approximately 8 feet in a little over 2 miles, the lower 4-foot fall being abrupt as at a dam. In 1848 a private corporation, known as the Wabash Navigation Co., with a charter from the States of Illinois and Indiana, built at this point a lock and dam of rock-filled cribs. The charter of this company was purchased by the Government in 1874. In 1887, the old lock and dam having become useless, the Government began the construction of the present lock and dam, which were completed in 1894.

4. The cost to the Government of this lock and dam, including original purchase, construction, repairs, and maintenance and operation, to June 30, 1915, is as follows:

Purchase of charter	$7,000.00
Cost of abutment (approximate)	10,194.29
Cost of dam (approximate)	50,000.00
Cost of lock (approximate)	200,718.16
Operating and care to June 30, 1915	83,422.67
Total cost (approximate)	351,335.12

5. The present dam is a rock-filled sheathed crib structure. The lock is on the Indiana side and is built of cut stone, having concrete guide and guard walls. Both lock and dam are on rock foundation. The lift of the dam is approximately 11.80 feet, and provides a pool above the dam for about 12.3 miles. The width of the lock is 52 feet, with available length of 214 feet. The depth on upper miter sill at low water is 5.08 feet, and on lower miter sill 3.20 feet.

6. This dam provides navigation at low water for only 12.3 miles, the length of the pool, navigation being obstructed at that stage both above and below the pool by bars upon which is found a depth of approximately 1 foot. However, any boats reaching the dam can pass the rapids through the lock, while if the dam should be removed it is probable that it would be impossible to pass the rapids at a stage of less than 10 feet above low water.

7. At the present time, with the Grand Rapids Lock in operation, the greatest obstruction to through navigation from the upper river to the Ohio exists below New Harmony, which is at Mile 51, or approximately 46 miles below the Grand Rapids Lock. At this place there are two channels around Ribeyres Island. The old river, as the old channel is called, is 10 miles in length, and for 9 miles there is practically no water for navigation at low stages. The bottom is sand and gravel. This island was formerly a point of land, which

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; cut off by the river more than a century ago. The cut-off is wn as the New Harmony Cut-Off, and is about 2¼ miles in length, 0 feet of which, near the lower end, is a rapids over rock and is ctically unnavigable below a 12-foot stage. The greater part of river discharge goes down the cut-off at all stages, and in order to ect the water back into the old channel the Government built a a across the head of the cut-off. The dam, as finally completed in 8, was 575 feet long and about 15 feet above low water. In 1886 river cut a new channel around the island end of the dam and now vs through the cut-off as before.

. If the old river channel should be cleared of snags and the st bars dredged, even with the cut-off open that section of the er would be navigable at a stage of about 8 feet and upward. With cut-off closed by a new dam, the old river route would be similar the remainder of the Wabash River in slope, bottom, bars, etc. nsequently, unless the New Harmony Cut-off be closed and the river channel be cleaned out, there can be no through navigation the river except at stages higher than 8 feet above low water. The oval of the Grand Rapids Dam would prevent through navi- ion at stages below 10 feet above low water. At Mount Carmel gauge registers 8 feet or more on an average of 82 days per year, l 10 feet or more 62 days per year. It will be seen, therefore, t the probable average number of days during which possible ough navigation would be decreased by the removal of the Grand pids Dam is 20. However, there is no through navigation under sent conditions, and therefore the removal of the Grand Rapids m could not further decrease it.

). The removal of the dam would, of course, interrupt navigation ween Mount Carmel and the upper river at stages below 10 feet, , as will be shown by the commercial statistics, such navigation is no consequence; and, in my opinion, unless the river is to be im- oved at an early date to provide a definite navigable depth oughout the length of the river from Terre Haute to its mouth, maintenance of the dam at Grand Rapids is of such little benefit t the expense involved is not justified.

10. Owing to the obstruction to navigation at New Harmony no ducts are transported into the Ohio River from points above the -off. At certain places on the river the people alongside the eam use it for transporting agricultural products short distances, d the lock and dam at Grand Rapids enable the people living adja- t to the pool created by the dam to ship produce to Mount Carmel. e following statement of traffic passing the lock at Grand Rapids, abash River, during the calendar year 1914, is submitted:

TRAFFIC.

Kind of craft.	Number.	Net registered tonnage.
senger boats	188	742
rboats	107	724
ges	24	1,375
all craft	170	420
Total	489	3,261
kages	330	.....

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COMMERCE.

Articles.	Short tons.	Value.
Corn	113	$2,25[illegible]
Shells	4	[illegible]
Miscellaneous	70	7,0[illegible]
Total	187	9,2[illegible]
Passengers, number	543	.....

During the six months ending June 30, 1915, the traffic has amounted to 42 tons, valued at $4,290.

It should be noted that what are listed above as towboats and passenger boats are merely small motor boats, mostly used for pleasure, and those listed as small craft are rowboats and skiffs.

11. The annual expense of operating this dam has averaged during the last 10 years $5,673.20, and this average will be probably greater in the immediate future. The dam is deteriorating rapidly and must soon be repaired if it is to be maintained, and because the use of timber is not economical in the long run, it is believed that it will be advisable to replace the dam by a concrete structure, or at least to replace the upper portion by a concrete cap. To do the latter will cost approximately $50,000. The lock, guide, and guard walls are in good condition, but if the lock is to be operated it will be necessary to replace the lock gates within the next year, and it is believed that steel should be used in accordance with present practice. New steel gates will cost approximately $10,000. If wooden gates are constructed they will cost $6,000. The average cost of operating the lock, taking care of the property and maintaining same will not be less than $2,500 per year. If the work is abandoned there will be some slight expense due to the fact that there are buildings on the Government property, and it will be advisable to keep them in repair. It is thought that a caretaker can be found who will take care of the property if allowed to occupy the buildings rent free, and the only expense to the Government would be the maintenance of the buildings. It is evident, therefore, that this lock and dam, if maintained and operated, will cost the Government over $100,000 during the next 20 years, without considering any extraordinary repairs which may become necessary and which can not now be foreseen.

12. In case it should be decided to tear out the dam, it would not be necessary to remove the lock. The movable parts, such as valves, gate-operating mechanism, etc., could be stored, and the lock, guide and guard walls would not suffer from nonuse; nor will it be necessary to remove the whole dam. It is thought a breach 500 feet long will be sufficient, and it is estimated that it will cost $10,000 to remove 500 feet of the dam.

13. The conditions at the dam are not favorable for water-power projects. The low-water flow is about 2,000 cubic foot-seconds, with mean low-water flow of 2,500 cubic foot-seconds. The dam leaks considerably, so that the available water for power would be decreased, due to leakage and lockages, by probably 500 cubic foot-seconds. The head at low water is approximately 12 feet, but this

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head is decreased as the flow increases until at high stages the head is reduced to almost nothing. The banks adjacent to the pool are low, and to raise the dam would probably cause suits for land damage due to overflows. The water power at this site was advertised last year, but no bids were received. Due to these facts and to my experience with the use of power at the Muskingum River dams, and to several investigations of power projects on the Kentucky River, I do not believe the available power at the Grand Rapids dam has any value at present.

14. I have considered this matter carefully from all points of view, and I can not see any advantage to the United States in continuing to operate this lock and maintain the dam. I therefore recommend that a breach, at least 500 feet long, be made in the dam, and that the operation of the lock cease.

J. C. OAKES,
Major, Corps of Engineers.

[First indorsement.]

OFFICE DIVISION ENGINEER, CENTRAL DIVISION,
July 10, 1915.

To CHIEF OF ENGINEERS:

I concur generally in the views and recommendations of the district officer, but think it desirable to reduce the cost of making an opening in the dam.

H. JERVEY,
Lieut. Col., Corps of Engineers,
Division Engineer.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 428.

LITTLE PIGEON RIVER, TENN.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON REEXAMINATION OF LITTLE PIGEON RIVER, TENN.

DECEMBER 17, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 16, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated July 20, 1915, together with copies of reports from Maj. H. Burgess, Corps of Engineers, and the Board of Engineers for Rivers and Harbors, dated June 16, 1915, and June 30, 1915, on reexamination of Little Pigeon River, Tenn., made in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, July 20, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Reexamination of Little Pigeon River, Tenn.

1. Under authority contained in section 14 of the river and harbor act approved March 4, 1915, there are submitted herewith for trans-

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mission to Congress report dated June 16, 1915, by Maj. H. Burgess, Corps of Engineers, and report dated June 30, 1915, by the Board of Engineers for Rivers and Harbors, relative to the improvement of Little Pigeon River, Tenn.

2. This stream is a small tributary of the French Broad River. There is no separate project for its improvement, but some work has been done on the bar at its mouth in connection with the improvement of the French Broad. This bar is actually located in the latter stream. The district officer states that there appears to be no present utility in redredging the entrance into the Little Pigeon. He therefore recommends that the Little Pigeon be dropped from the list of streams under improvement by the United States. The division engineer and the Board of Engineers for Rivers and Harbors concur in this recommendation.

3. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors and therefore recommend that legislation be enacted authorizing the abandonment of the improvement of the Little Pigeon River, Tenn.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
June 30, 1915.

To the CHIEF OF ENGINEERS UNITED STATES ARMY:

1. This report on Little Pigeon River, Tenn., is submitted under authority of that portion of section 14 of the act of March 4, 1915, which reads, "and the Chief of Engineers is directed to make a report upon any other projects, river or harbor, the further improvement of which under present conditions is undesirable, or in which modifications of the plans or projects should be made."

2. This stream is a small tributary of the French Broad River, about 5 miles in length and having a minimum low-water depth of about 12 inches and an average slope of 8.3 feet per mile, the maximum slope being 16 feet to the mile. Ordinarily traffic has been confined to the lower mile, but occasionally boats reached the village of Catlettsburg, 3 miles above the mouth. The small commerce is not separable from that of the French Broad River.

3. There is no separate project for the Little Pigeon River, but some small expenditures have been made for work on the bar at its mouth in connection with the improvement of the French Broad, which work is really within the last-named river. In view of the conditions described above, the district officer recommends that the Little Pigeon River be dropped from the list of streams under improvement by the United States. The division engineer concurs in this recommendation.

4. It appears from available data that very little commerce may be expected from this small stream, and that its steep slope, rocky

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bottom, and small low-water discharge render an effective improvement impracticable at reasonable cost. The board therefore concurs with the district officer and the division engineer and recommends legislation authorizing the abandonment of the improvement of the Little Pigeon River, Tenn.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

REEXAMINATION OF LITTLE PIGEON RIVER, TENN.

UNITED STATES ENGINEER OFFICE,
Nashville, Tenn., June 16, 1915.

From: The District Engineer Officer, Chattanooga district.
To: The Chief of Engineers United States Army.
(Through the Division Engineer.)
Subject: Improvement of Little Pigeon River, Tenn.

1. In compliance with the instructions, I have to make the following report on the project for improving the Little Pigeon River, with a view to its abandonment or modification:

DESCRIPTIVE.

2. The Little Pigeon is a branch of the French Broad River, joining it 29 miles above the junction of the latter stream with the Holston. The Little Pigeon is formed by two branches, known as East and West Forks, which join at Sevierville, Tenn.; is only 5 miles long and about 140 to 200 feet wide; and has a minimum low-water channel depth of about 12 inches. The total fall at low water in this stream is 29.4 feet, of which 26.6 feet occurs in the first 3.2 miles. The average slope per mile is 8.3 feet for the upper 3.2 miles and only about 1.6 feet for the lower 1.8 miles. The maximum slope is 16 feet to the mile. There are six or seven shoals, mostly rock, but some being composed also of overlying gravel. So far as known, the low-water discharge has not been measured, but it was estimated to be nearly 200 cubic feet per second.

3. Sevierville is a town of about 700 people, situated at the head of this stream, and is the terminus of a short railroad, connecting it with Knoxville. Catlettsburg is on the Little Pigeon, 3 miles from the mouth, and is a village of about 100 population. Prior to the construction of the railroad the population of the Little Pigeon Valley made use of the French Broad River for transportation, and, whenever practicable, the boats engaged in carrying for this valley entered the Little Pigeon and passed upstream as far as the stage of the water permitted. On occasions the boats reached Catlettsburg, but ordinarily landed at the "warehouse," 1 mile from the mouth, where goods were received or delivered for the towns of Catlettsburg and Sevierville, flat boats being used to a considerable extent between the warehouse and the towns.

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HISTORICAL.

4. In 1890 this stream was examined by Lieut. Col. J. W. Barlow, Corps of Engineers, whose report, dated January 3, 1891, is printed on pages 2287–2288 of the Annual Report of the Chief of Engineers for 1891. The object desired by the people of the locality was the improvement of the river throughout, so as to permit the French Broad boats to reach Sevierville, but Col. Barlow reported that the improvement to the head of the stream could be made only by heavy rock excavations through a number of reefs, or by the construction of locks and dams, in either case involving an expense not warranted. He stated—

> The improvement of the Little Pigeon River as far up as the warehouse would, in my opinion, be very desirable, as there is no landing on the French Broad River in this vicinity, and the construction of such a landing and a road leading to it would be difficult, owing to the topography of the country. The cost of this improvement would be moderate, probably about $10,000, and would, I think, be justified.

On the section below the warehouse, about 1 mile, he found that the only obstruction was the bar at the mouth of the stream, whose removal would permit the boats to go to the warehouse whenever they could navigate the French Broad to the mouth of the Little Pigeon. While expressing a view favorable to the removal of the bar, he did not recommend it, but expressed, rather, the idea that the work suggested for this 1 mile of the Little Pigeon should await the improvement of the French Broad. He reported that the Little Pigeon from the mouth to Sevierville was not worthy of improvement by the General Government.

5. The river and harbor act of July 13, 1892, provided that of the $15,000 appropriated for the French Broad River $1,000 "may be used in removing the bar or shoal in Little Pigeon River." This sum was allotted for the removal of the bar at the mouth of the river, and this is the only separate appropriation which has been made for the Little Pigeon. In addition to the improvement accomplished with this amount, work has been done on the shoal referred to from appropriations made for the French Broad, although no exact record has been kept of the total expenditure for the improvement designed to permit entrance into the Little Pigeon. It appears that all the work done was in the French Broad itself, but that the improvement effected was for the benefit of the Little Pigeon, and of little or no advantage to navigation on the main stream. The improvement consisted in excavating a small quantity of rock and gravel and in constructing short dikes for the purpose of confining more closely the water from the Little Pigeon where it passes over the bar into the main stream. By the end of the fiscal year 1896 there had been expended on the work a total of $1,150.39, and it appears that the entrance was improved sufficiently to permit the boats to reach the warehouse. Some additional work was done in 1897 to remove gravel deposited since the previous dredging, but no statement was made of the cost.

6. In the report of the district officer for 1899 is the following:

> The portion of the Little Pigeon River that is useful for navigation is too short to be treated as a separate river. It really amounts to an additional landing for the French Broad, and it is better that it should be provided for by allotments from the appropriation for the larger stream, as is now done.

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Thereafter the Little Pigeon has always been included with the French Broad in all reports. The only record of work done on this bar since 1897 is of the removal of three snags which had lodged at the entrance to the Little Pigeon. No recent examination has been made, but it is quite likely that the deposit of sand and gravel brought down by the tributary stream has very nearly restored the bar to its original condition.

7. In 1899 a survey of the French Broad River covered also the full length of the Little Pigeon (report on the French Broad survey is printed as House Document No. 616, Fifty-sixth Congress, first session, and also in the Annual Report, Chief of Engineers, 1900, page 3018 et seq.), but no plan of improvement was proposed for the tributary stream other than of the bar at its entrance. This bar was treated as one of those obstructing the French Broad, as it actually does lie within that stream, and the estimated cost of its improvement was given at $11,550. The project for improving the French Broad not having been adopted by Congress, the permanent improvement of the entrance to the Little Pigeon has never been undertaken. Nor, in fact, has there ever been adopted any plan of improvement which might properly be called a project.

COMMERCIAL.

8. No separate record has been kept for traffic on the Little Pigeon, the boats landing at the warehouse, 1 mile from the mouth, or at Catlettsburg, 3 miles above the mouth, being considered as engaged in traffic on the French Broad. In the report of January 3, 1891, on the improvement of the Little Pigeon it was estimated that "the amount of freight carried in and out of Little Pigeon, as stated by the carriers, is greater than carried on the French Broad above that stream." Subsequent to that time the railroad has been constructed between Knoxville and Sevierville, and it is probable that the effect of the new line of transportation was the abandonment of the Little Pigeon-French Broad route by the inhabitants of Sevierville and vicinity. There has been a falling off in the traffic on the French Broad River, and a more detailed discussion of this question is given in my report of this date on the improvement of the French Broad. In the past three years none of the boats operating on the French Broad has reported making landings in the Little Pigeon, but it is known from the local assistants that occasional trips up to the warehouse are made, chiefly for the purpose of receiving farm products for transportation to Knoxville.

RECOMMENDATION.

9. There appears to be no present utility in redredging the entrance into the Little Pigeon, and if future commercial needs indicate the desirability of making this minor improvement in the nature of maintenance work, it can readily be done in connection with the maintenance of channels on the French Broad, the bar actually being located in the latter stream. It is recommended that

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the Little Pigeon be dropped from the list of streams under improvement by the United States.

H. BURGESS,
Major, Corps of Engineers.

[First indorsement.]

OFFICE DIVISION ENGINEER, CENTRAL DIVISON,
June 22, 1915.

To CHIEF OF ENGINEERS:

I concur in the views and recommendation of the district officer.

H. JERVEY,
Lieut. Col., Corps of Engineers,
Division Engineer.

[For report of the Board of Engineers for Rivers and Harbors see p. 2.]

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 429.

PENTWATER HARBOR, MICH.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF PENTWATER HARBOR, MICH., FROM THE MOUTH OF THE CHANNEL TO PENTWATER LAKE.

DECEMBER 17, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 16, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated August 12, 1915, together with copy of a report from Maj. F. W. Altstaetter, Corps of Engineers, dated April 29, 1915, with map, on preliminary examination of Pentwater Harbor, Mich., made by him in compliance with the provisions of the river and harbor act approved February 27, 1911.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, August 12, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Pentwater Harbor, Mich.

1. There is submitted herewith, for transmission to Congress, report dated April 29, 1915, with map, by Maj. F. W. Altstaetter,

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Corps of Engineers, on preliminary examination of Pentwater Harbor, Mich., from the mouth of the channel to Pentwater Lake, called for by the river and harbor act approved February 27, 1911.

2. Pentwater Harbor is situated on the east shore of Lake Michigan about 11½ miles south of Ludington Harbor and 43 miles north of Muskegon Harbor. The existing project provides for a channel 16 feet deep and 150 feet wide, protected by suitable piers and revetments. This project has been completed with the exception of an extension of about 200 feet to the south pier. The total expenditures to March 4, 1915, amounted to $342,006.61, the expenditures for maintenance in recent years having averaged about $5,100 annually, or more than $1 per ton of freight carried. In view of the conditions existing at this harbor, the district officer in 1909 recommended its abandonment, and this recommendation has been included in recent annual reports of the Chief of Engineers. As a result of the present investigation the district officer now reaches a similar conclusion and recommends that the harbor be abandoned. In the opinion of the division engineer the harbor is not worthy of any improvement in amplification of the present project, but it is worthy of maintenance of the existing piers and of the present project channel for such width, less than the project width of 150 feet, as may be necessary for the harbor traffic.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated June 15, 1915, concurring in the views of the district officer.

4. After due consideration of the above-mentioned reports I concur in the views of the district officer and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Pentwater Harbor, Mich., from the mouth of the channel to Pentwater Lake is deemed unworthy of further continuance or maintenance, and it is recommended that the project be abandoned and appropriations for this harbor discontinued.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
June 15, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's report on preliminary examination of Pentwater Harbor, Mich., from the mouth of the channel to Pentwater Lake, called for by the act of February 27, 1911.

2. Pentwater Harbor is situated on the east shore of Lake Michigan, 11½ miles south of Ludington Harbor and 43 miles north of Muskegon Harbor. The existing project provides for a channel 16 feet deep and 150 feet wide protected by suitable piers and revetments. The project has been completed except for an extension of

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200 feet on the south pier. The amount expended to March 4, 1915, was $342,006.61. The cost of maintenance in recent years has averaged about $5,100 annually, the principal work being dredging between and in the approach to the piers, where shoals form each year. Except for the outer end of the north piers the structures are in fair condition.

3. The population of Pentwater in 1910 was 1,129 and apparently it has not changed materially since. The population of Oceana County, in which Pentwater is situated, is reported as 18,379, but only a small part of this population is naturally tributary to Pentwater Harbor. Formerly this territory was covered with valuable timber and a business of considerable importance was done in this commodity, but the forests have practically disappeared and the land is being turned into fruit orchards, the products of which now form the principal articles of commerce.

4. An examination of the records shows that for the past eight years the commerce has averaged about 3,500 tons, except for 1914, when 9,900 tons of crushed stone was brought in for use on the county roads. There has been no material change for many years, and owing to the character of the commerce and the limited area from which it comes there seems to be no reason to anticipate any increase. In view of the high cost of maintenance, the improbability of a favorable change, and the small community to be served the district officer recommends that this harbor be abandoned. The division engineer is of opinion that Pentwater Harbor is not worthy of any improvement in amplification of the present project, but in view of the law of 1910, which directed that the balance of appropriations and allotments heretofore made be expended in maintenance in accordance with the present projects, it is worthy of maintenance of existing piers and of the present project channel for such width, less than the project width of 150 feet, as may be necessary for the harbor traffic.

5. It will be seen from data now available that the annual cost of maintenance is unjustifiably high when compared with the traffic. This, moreover, is on the basis of temporary repairs only. If the harbor is to be kept up, large expenditures for the reconstruction of the piers will have to be incurred or else the cost of annual maintenance will increase. The amount of commerce now handled is very small, and the limited area of the tributary country and the lack of any large manufacturing or industrial concerns renders any material increase improbable. The board therefore considers this harbor unworthy of further expenditures, either in amplification or maintenance of the existing project, and it accordingly recommends that the project be abandoned.

6. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other related subjects which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

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PRELIMINARY EXAMINATION OF PENTWATER HARBOR, MICH.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Grand Rapids, Mich., April 29, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Preliminary examination of Pentwater Harbor.

1. In compliance with third indorsement, Office Chief of Engineers, dated November 24, 1913, the following report is submitted on preliminary examination of Pentwater Harbor, provided for by river and harbor act of February 27, 1911, as follows: Pentwater Harbor, Mich., from the mouth of the channel to Pentwater Lake.

2. *Geographical position.*—Pentwater Harbor, shown on map herewith, is situated in Oceana County on the east shore of Lake Michigan, midway between Little Sable Point on the south and Ludington Harbor on the north. Ludington Harbor entrance is 11½ miles north and the nearest ports on the south are White Lake and Muskegon Harbor, distant by steamer track about 32 miles and 43 miles, respectively. It is, roughly, 150 miles by water from Chicago and 90 miles from Milwaukee. The harbor is the natural outlet of Pentwater River, which stream before reaching Lake Michigan expands into Pentwater Lake. This lake is about 2 miles long and one-half mile wide, with depths ranging from 20 to 50 feet in the western portion, with decreasing depths in the eastern portion.

3. *Object.*—The object of the examination is not stated in the act. The citizens of Pentwater are very much concerned about the harbor, and it is believed that the survey was called for at the instigation of those who feared that the harbor might be abandoned at an early date as a result of the recommendation to that effect made in the Chief of Engineers' Annual Report for 1909.

4. *Population.*—The population (1910) of Pentwater Village was 1,129, and it has not changed greatly since. The country tributary to Pentwater Harbor is otherwise rural, except Hart, a village slightly larger than Pentwater. The population of the entire county (Oceana) was 18,379, mostly rural.

5. *Work done and present condition.*—In 1866, previous to any Government improvement, the outlet from Pentwater Lake to Lake Michigan was through a very irregular channel about 1,440 feet long, 75 feet wide, and 4 feet deep, protected on either side by slab piers and revetments built by local enterprise. The work of improving this channel was taken over by the United States under the project of 1867 and operations were begun the same year. This project was to increase the channel width and depth to 150 feet and 12 feet, respectively, and to protect the sides by piers and revetments. Subsequent amendments, in 1873, 1884, and 1892, to the original project relate merely to the length of the proposed piers and revetments. However, the act of March 2, 1907, authorized the Secretary of War "to dredge the channel at Pentwater to the depth of 16 feet," depth defined as at "mean low water." This authorization has been construed to change the project depth from 12 feet navigable depth to 16 feet navigable depth at low water.

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The approved project is about 85 per cent completed, there being still required 200 feet extension to the south pier. The south revetment for a distance of about 250 feet from the inner end of the Government work to Pentwater Lake belongs to the Pere Marquette Railroad Co., and is in a very dilapidated condition.

The last work done toward the completion of the project was in 1889, when the south pier was extended by 50 linear feet of crib work. Since 1898 the north pier and revetment has been repaired throughout, with the exception of about 100 linear feet at the outer end, and the south pier and revetment repaired, except for a length of about 557 linear feet. Except for the outer end of the north pier, which is wrecked, the structures are in very fair condition. Depths over the inner portion of the channel are fairly stable, but shoals requiring annual dredging persist in forming between the shore line and the outer end of the piers and in Lake Michigan at the entrance to the piers. Since 1899 dredging to remove these shoals has been done each year, with the single exception of 1901. This dredging, however, provides only for increased depths for periods of greater or less duration, depending entirely upon the occurrence and effect of severe storms, which may occur at any time and fill the dredged area with sand from the shoals adjacent to the harbor entrance. This condition can be remedied only by the extension of both piers. The map herewith shows the soundings in April, 1914.

To March 4, 1915, there was expended on the present project the sum of $342,006.61, of which $179,899.10 was for works of improvement and $162,107.51 was for maintenance. The cost of maintenance in recent years has been about $5,100 per annum.

6. *Previous examinations and reports.*—Report upon a previous examination of this harbor was made in 1906 and is printed in House Document No. 181, Fifty-ninth Congress, second session. In that report the district officer recommended the adoption of a project providing a depth of 16 feet. The Board of Engineers for Rivers and Harbors recommends that the dredging be carried to a depth of 16 feet, but no other work done. In this the Chief of Engineers concurred.

May 27, 1909, the district officer made a special report to the Chief of Engineers on conditions at Pentwater Harbor and recommended the abandonment of this harbor. The Board of Engineers for Rivers and Harbors concurred in the report. The board was requested to reexamine the report, which they did, adhering to their original opinions. The reexamination is published in River and Harbor Committee Document No. 11, House of Representatives, Sixty-first Congress, second session. The report by the district officer and the report of the board are referred to in Annual Report of the Chief of Engineers, 1909, page 740, the Chief of Engineers concurring in the views of the board.

7. *Cost of repair and maintenance.*—Should this harbor be maintained indefinitely under the present project, the piers should be completed before many years and the old work thoroughly overhauled. This could be done at a cost estimated at $100,000, and maintained thereafter at $5,000 a year. The harbor could probably be maintained in a satisfactory condition for some years without any

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serious repairs, allowing the piers and revetments to gradually fall into decay, making only minor emergency repairs. The annual cost of thus maintaining the harbor for a limited period is estimated at $4,000.

8. *Railroads.*—Pentwater is the end of a branch of the Pere Marquette Railroad, which, however, runs to the south shore while the village is on the north shore of the entrance and of Pentwater Lake. There is a public ferry, run by hand, maintained jointly by the railroad and the village. The nearest harbor by rail is White Lake Harbor, 27 miles distant, but this is a small place with poor boat service. The next harbor is Muskegon, distant 42 miles.

9. *Freight rates and water service.*—Prior to 1911 it was necessary for vessel freight to be shipped by way of Ludington on a small coastwise steamer, making two daily round trips between Pentwater and Ludington, and connecting at the latter port with the trans-lake steamers. Since that time this port has enjoyed the following service:

Pentwater to Milwaukee, via Ludington, and Pentwater to Chicago, via Northern Michigan Transportation Co. from Ludington.

PERE MARQUETTE LINE STEAMERS.

Year.	Regular service began—	Regular service ceased—	Round trips per week.
1911	May 7	Oct. 12	14
1912	May 8	Oct. 15	14
1913	May 13	Sept. 2	14
1914	May —	Sept. —	14

In addition several trips were made before and after the regular service schedule.

Pentwater to Milwaukee direct.

PERE MARQUETTE LINE STEAMERS.

Year.	Regular service began—	Regular service ceased—	Round trips per week.
1911 (no service)			
1912	Aug. 28	Sept. 10	7
1913	Sept. 2	Oct. 12	7
1914 (during fruit shipping season)			6

HILL STEAMBOAT LINE.

1911 (summer season)			
1912 (no service)			
1913	Aug. 18	Oct. 11	6
1914 (no service)			

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The following table gives prevailing freight rates:

Rates for 1915.

[Cents per hundredweight.]

	Pentwater to Milwaukee by rail.	Pentwater or Ludington to Milwaukee by water.	Pentwater to Chicago by rail.	Pentwater to Chicago by water.
Class 1	34.7	30	39.4	38.8
Class 2	29.9	26	33.6	31.5
Class 3	23.1	21	26.3	26.3
Class 4	15.8	14	17.9	16.8
Class 5	12.6	10	14.2	12.6
Class 6	10.0	9	11.6	10.5
	126.1	11.0	143.0	136.5

10. *Commercial statistics.*—Commercial statistics of vessel traffic are difficult to obtain for Pentwater Harbor. From available records, the vessel traffic accredited to Pentwater Harbor is as follows:

TABLE I.—*Season of navigation.*

[Year 1914. Opened Mar. 14, closed Dec. 6.]

VESSEL CLASSIFICATION.

Class.	Total.	Net registered tonnage.	Passengers carried.
Arrived			2,219
Registered steam vessels	306	54,492	
Registered sail vessels	7	522	
Registered barges	5	4,575	
Departed			2,185
Registered steam vessels	306	54,492	
Registered sail vessels	7	522	
Registered barges	5	4,575	
Total	636	119,178	4,404

LOCAL FISH TUGS.[1]

	Number.	Tonnage.
Arrived:		
Registered steam vessels	236	1,654
Registered gasoline vessels	222	1,554
Departed:		
Registered steam vessels	236	1,654
Registered gasoline vessels	222	1,554
Total	916	6,416

[1] Small fish tugs fishing out of this harbor, having an average net registered tonnage of 7.1.

The Hill Steamboat line did not operate at this harbor this year.

The Pere Marquette line steamers operated a regular line between Pentwater and Ludington from May to the first part of September and a regular line between Pentwater and Milwaukee during the fruit-shipping season.

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TABLE I.—*Season of navigation*—Continued.

FREIGHT TRAFFIC.

Articles.	Customary units.	Short tons.	Valuation.
RECEIPTS.			
Cabbage.....tons..	52	52	[illegible]
Castings.....do....	13	13	1,[illegible]
Crushed stone.....cubic yards..	7,937	9,921	[illegible]
Dry goods.....tons..	16	16	[illegible]
Flour and feed.....do....	57	57	[illegible]
Fresh fish.....do....	113	113	[illegible]
Fruit.....do....	6	6	[illegible]
Furniture.....do....	15	15	[illegible]
General merchandise.....do....	160	160	[illegible]
Groceries.....do....	66	66	[illegible]
Hardware and paints.....do....	22	22	[illegible]
Lumber products.....M feet..	160	330	[illegible]
Meat products.....tons..	44	44	[illegible]
Notions.....do....	23	23	[illegible]
Seed peas.....bushels..	4,660	122	[illegible]
Total receipts.....	.....	10,950	[illegible]
SHIPMENTS.			
Apples.....barrels..	5,323	426	[illegible]
Canned goods.....cases..	2,264	44	[illegible]
Fruit.....tons..	525	525	[illegible]
General merchandise.....do....	30	30	[illegible]
Machinery.....do....	28	28	[illegible]
Peaches.....bushels..	26,046	651	[illegible]
Potatoes.....do....	8,100	243	[illegible]
Total shipments.....	.....	1,947	[illegible]
Grand total.....	.....	12,897	[illegible]

TABLE II.

Calendar year.	1 Receipts.	2 Shipments.	3 Total.	4 Valuation.	5 Increase or decrease.	6 Shipments consisting of produce, fruits, and dairy products (included in columns 1 to 3).	7 Total passengers arriving and departing.[1]
	Short tons.	*Short tons.*	*Short tons.*		*Short tons.*		
1907	875	1,657	2,532	.....	−886	1,657	.....
1908	1,072	1,359	2,431	.....	−101	900	[illegible]
1909	.....	.....	4,639	$294,657	+2,208	.....	[illegible]
1910	2,832	1,445	4,277	92,626	−362	1,170	[illegible]
1911	1,299	3,120	4,419	257,375	+142	1,260	[illegible]
1912	693	926	1,619	159,713	−2,800	327	[illegible]
1913	1,980	1,547	3,527	264,213	+1,908	850	[illegible]
1914	10,950	1,947	12,897	214,248	[2] +9,370	1,889	[illegible]

[1] About 50 per cent are arrivals and 50 per cent are departures.
[2] About 9,900 tons of crushed stone for road improvement was used near Pentwater, and accounts for this increase.

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TABLE III.

	1907		1908		1910		1911	
	Customary units.	Short tons.	Customary units.	Short tons.	Customary units.	Short tons.	Customary units.	Short tons.
RECEIPTS.								
Canned goods	150 tons.	150	26 tons.	26				
Coal, soft					2 tons	2		
Crushed stone			400 tons.	400	2,210 cubic yards	2,431	60 cubic yards.	312
Flour and feed					2 tons	2		
Lumber	400 tons.	400	21 tons.	21	20 M feet	40	35 M feet	70
Manufactured iron					37 tons	37		
Miscellaneous merchandise.	325 tons.	325	625 tons.	625	200 tons	200	401 tons	401
Salt					10 tons	10	16 tons	16
Seed peas					3,659 bushels	110		
Total receipts		875		1,072		2,832		1,299
SHIPMENTS.								
Canned goods	507 tons.	507	200 tons.	200	1,114 cases	24		
Express, fruit							600 tons	600
Fruits, meat, and fish			909 tons.	909				
Fruit, fish, potatoes, and miscellaneous					550 tons	550	2,520 tons	2,520
Peaches	400 tons.	400						
Potatoes	750 tons.	750	250 tons.	250	871 tons	871		
Total shipments.		1,657		1,359		1,445		3,120
Grand total		2,532		2,431		4,277		4,419

	1912		1913		1914	
	Customary units.	Short tons.	Customary units.	Short tons.	Customary units.	Short tons.
RECEIPTS.						
Beer and liquors			43 tons	43		
Cabbage					82 tons	82
Canning supplies	10 tons	10	24 tons	24		
Castings					13 tons	13
Crushed stone			725 cubic yards	906	7,937 cubic yards	9,921
Dressed meats			8 tons	8		
Drugs and sundries			4 tons	4		
Dry goods	43 tons	43	54 tons	54	16 tons	16
Flour and feed					57 tons	57
Furniture					15 tons	15
Fresh fish			109 tons	109	113 tons	113
Fruit					6 tons	6
Groceries	125 tons	125	172 tons	172	66 tons	66
Hardware	25 tons	25				
Hardware and paints			31 tons	31	22 tons	22
Lumber			249 M feet	478		
Lumber products					160 M feet	320
Machinery	35 tons	35				
Machinery and castings			30 tons	30		
Meat products					44 tons	44
Miscellaneous merchandise	305 tons	305	44 tons	44	160 tons	160
Notions			2 tons	2	23 tons	23
Seed peas					4,660 bushels	122
Shingles	150 tons	150	75 tons	75		
Total receipts		693		1,999		10,960
SHIPMENTS.						
Apples					5,323 barrels	426
Canned goods	4,856 pounds 134 tons	2 134	300 cases	8	2,264 cases	44
Express, fruit	325 tons	325	175 tons 19,315 bushels 621 barrels	705	525 tons	525

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TABLE III—Continued.

	1912		1913		1914	
	Customary units.	Short tons.	Customary units.	Short tons.	Customary units.	Short tons.
SHIPMENTS—contd.						
Machinery			23 tons	23	28 tons	28
Miscellaneous merchandise	465 tons	465	674 tons	674	30 tons	30
Peaches					26,046 bushels	651
Potatoes			4,503 bushels	137	8,100 bushels	243
Total shipments		926		1,547		1,947
Grand total		1,619		3,527		12,397

11. *Conclusions and recommendation.*—The vicinity of Pentwater was formerly a lumber country, and the harbor works were built to accommodate this trade. The lumber is now exhausted, and the country is adjusting itself to the new conditions. The citizens of Pentwater maintain that there is a prosperous future ahead of it, with the development of the fruit farms in the vicinity, and with the growth of Pentwater as a summer resort. The quick, cool, night trip across Lake Michigan to Milwaukee, with low freight rate, is, undoubtedly, very favorable to the fruit interests, and fruit raising is profitable, but the region tributary to Pentwater is too small to expect a very large development in this line. At present there is a fair development as a summer resort, but the climate and all other conditions are favorable to a greater one. It is, nevertheless, very problematic whether there will ever be sufficient growth here to warrant the National Government in undertaking the entire work of maintaining this harbor. The average tonnage for the last eight years is 4,543 tons, and the average number of passengers for the last seven years (the limit of records) is 6,388 passengers. Using these figures with $5,100 as the annual maintenance charge, we find the cost per ton of freight moved is $1.12, if all expenditures are charged against the freight. If each passenger is counted the equivalent of a ton of freight, the charge becomes $0.466 against each ton and each passenger.

From the freight rates given in paragraph 9 it is seen that to Chicago the difference between water and rail rates per ton vary from 0 to 42 cents, and to Milwaukee from 20 to 97 cents per ton. The fruit and dairy traffic with Milwaukee is the traffic the citizens of Pentwater seem most exercised about, claiming that the abandonment of the harbor will mean a complete cessation of any such traffic with Milwaukee.

Harbors near by seem to give the service needed except for a small community. A trolley line to Ludington Harbor would solve the problem, and probably give much better satisfaction than the local harbor. Maintaining this harbor is largely a question of local development, which might induce local interests to offer to defray part of the harbor costs. It is a more or less undeveloped country, and there are no large wealthy interests which could be expected to contribute, and the outlook for local cooperation is not hopeful.

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The money on hand ($8,000) will dredge this harbor so it will be in a serviceable condition for two or three years. This procedure is in harmony with what has been done here the last few years, and will be presumably continued until the money on hand is expended.

In view of the high cost of maintenance at this harbor per ton of freight or per passenger moved, the improbability of a change in conditions which would reduce these unit costs to a reasonable figure; in view of the small community served and the value of the improvement, largely as a means of local development, which value could as well be obtained by an electrical railroad, I am forced to the opinion that this harbor should be abandoned, and I so recommend.

12. *Terminal facilities, etc.*—The railroad company has a dock 70 feet long and about 50 feet from the railroad track, which offers water and rail transfer facilities. There is about 15 feet of water in front of this dock. The other docks are all on the north side of Pentwater Lake and have no railroad connections. Starting at the north end of the lake the Sears & Nichols dock is 170 feet long, the Finches dock 110 feet long, the Pere Marquette Line Steamers dock is 180 feet long, the Sands & Maxwell dock 190 feet long, and they have, respectively, 15 feet, 16 feet, 16 feet, and 19 feet of water in front of them. These docks are all privately owned and are not available to the public free of charge. The Sands & Maxwell dock is used by the Hill steamboat line, which pays 10 per cent of the freight charges for its use and the services of an agent. The village controls the foot of two streets, each 66 feet wide, which could be made available for wharfage purposes free to the public if the traffic warranted such use. It was ascertained that the above docks cost approximately as follows: Sears & Nichols dock and warehouse, $6,000; Finches dock, $1,000; Pere Marquette Line steamers dock and warehouse, $5,000; Sands & Maxwell dock and warehouse, $10,000. No dredging has ever been necessary for maintenance in front of these docks. The only docks used at the present time are the Pere Marquette Line steamers dock and the Sands & Maxwell dock.

13. *Water power, etc.*—There is no water power, flood protection, forestation, or other matter which may properly be connected with the improvement of this harbor.

F. W. ALTSTAETTER,
Major, Corps of Engineers.

[First indorsement.]

OFFICE DIVISION ENGINEER, LAKES DIVISION,
Buffalo, N. Y., May 14, 1915.

To the CHIEF OF ENGINEERS:

1. Forwarded.

2. The present condition of Pentwater Harbor may be summarized as follows: The present project has been completed, except extension lakeward of 200 feet of the south pier, not now necessary; and except maintenance of the piers from Lake Michigan to Pentwater Lake and the channel between them 150 feet wide and 16 feet deep at low water, which is 2 feet below mean lake level, 1860–1875.

3. Funds are available for required maintenance for probably three years, to 1918.

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4. It can reasonably be expected that the freight and passenger traffic at this harbor will remain as at present, with possibly some increase.

5. The river and harbor act of June 25, 1910, provided as follows:

White Lake and Pentwater Harbors, Mich.: The Secretary of War is hereby authorized and directed to expend the balances of appropriations and allotments heretofore made for these harbors in maintaining the improvements in accordance with the present projects.

6. In view of the foregoing, while Pentwater Harbor is, in my opinion, not worthy of any improvement in amplification of the present project, it is worthy of maintenance of the existing pierhead of the present project channel for such width, less than the project width of 150 feet, as may be necessary for the harbor traffic.

J. G. WARREN,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors see p. 2.]

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Call Number

Mich., Apr. 29, 1915.

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64TH CONGRESS, 1st Session } HOUSE OF REPRESENTATIVES { DOCUMENT No. 434

CRESCENT CITY HARBOR, CAL.

LETTER FROM THE SECRETARY OF WAR

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORTS ON PRELIMINARY EXAMINATION AND SURVEY OF CRESCENT CITY HARBOR AND VICINITY, CAL., WITH A VIEW TO SECURING A SUITABLE HARBOR

DECEMBER 17, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration

WASHINGTON
GOVERNMENT PRINTING OFFICE
1916

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CRESCENT CITY HARBOR, CAL.

WAR DEPARTMENT,
Washington, December 16, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers United States Army, of this date, together with copies of reports from Lieut. Col. Thomas H. Rees, Corps of Engineers, dated April 19, 1913, and January 31, 1914, with map, on preliminary examination and survey, respectively, of Crescent City Harbor and vicinity, California, made by him in compliance with the provisions of the river and harbor act approved July 25, 1912.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 16, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination and survey of Crescent City Harbor, Cal.

1. There are submitted herewith for transmission to Congress reports dated April 19, 1913, and January 31, 1914, with map, by Lieut. Col. Thomas H. Rees, Corps of Engineers, on preliminary examination and survey, respectively, authorized by the river and harbor act approved July 25, 1912, of Crescent City Harbor and vicinity, California, with a view to securing a suitable harbor.

2. Under authority of the act of February 27, 1911, a preliminary examination was made of Crescent City Harbor, and in the report thereon, printed in House Document No. 720, Sixty-second Congress, second session, it was recommended that a new investigation be authorized covering Crescent City Harbor and vicinity. The points in the vicinity of Crescent City which have been suggested as possible harbor locations are Point St. George (or Wooleyport), Preston Island, and Lakes Earl and Talawa. As a result of his investigations, the district officer reaches the conclusion that the best natural harbor, and the one that could be most easily and economically improved and extended is at Crescent City. It is well protected from all points north of west, but is open to the southwest. A plan of improvement is proposed by the district officer contemplating a breakwater extending from Battery Point to Fauntleroy Rock, and a jetty or sand bar-

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rier from Whaler Island to the high-water beach line, the entrance to be between Fauntleroy Rock and Whaler Island. The area protected would be 460 acres at high water, and 361 acres at mean lower low water, of which 239 acres have a depth of 12 feet or more, 148 acres a depth of 18 feet or more, and 81 acres a depth of 24 feet or more at mean lower low water. The estimated cost of these structures is $1,828,750. Local interests have indicated their willingness to contribute toward the improvement the sum of $250,000, which appears to be the limit of their resources.

3. The commerce now existing at this locality is small and without improved transportation facilities would no doubt remain so. There is no other harbor along this coast for a distance of 100 miles in either direction. The district officer, who is also the division engineer, states that the timber, mineral, and agricultural resources of northern California and southern Oregon are seeking an outlet at this point and the construction of a connecting railroad will, in all probability, follow or accompany the creation of a harbor. He expresses the opinion that the locality is worthy of improvement by the United States to the extent indicated, at a total initial cost to the United States of $1,578,750 for construction, and a maintenance cost averaging $35,000 per year for four years, provided that an additional sum of $250,000 be contributed toward the work by local interests.

4. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated November 10, 1915. For the consideration of the board, additional estimates of cost were secured from the district officer, and are contained in his supplemental reports of May 15, 1915; July 14, 1915; and September 13, 1915. It is estimated that a harbor having a protected area of about 600 acres with depth not less than 24 feet would cost from $5,833,000 to $8,064,000, depending upon the type of construction, while a breakwater along the line A to C, indicated on the accompanying map, would cost $490,000. This latter breakwater would afford considerable protection and later form part of a greater project, if the commercial growth following its construction should indicate the need of increased facilities. The board believes that a safe harbor on this section of the coast would be of material advantage to the existing commerce and would encourage further development. It would also be of value to general navigation on the north Pacific by affording a place of refuge for vessels in distress. As a commercial harbor, however, its success is dependent upon the existence of suitable connections with the tributary country, whose resources are expected to form the basis of its future commerce. A railroad has been commenced from Grants Pass, Oreg., to Crescent City, and conditioned upon the assurance that this railroad will be completed within a reasonable time, the board believes that it is advisable for the United States to undertake the improvement of Crescent City Harbor by the construction of a breakwater, at an estimated cost of $490,000, approximately as shown on the map by the line AC, with a possible extension approximately on the line CD, if funds will permit; provided that local interests shall contribute $100,000 toward the work, and shall furnish, free of cost to the United States, such land as may be required for the operations of the Government in connection with this project.

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5. After due consideration of the above-mentioned reports, I concur in the views of the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Crescent City Harbor, Cal., is deemed advisable to the extent of constructing a breakwater approximately on the line AC indicated on accompanying map, at an estimated cost of $490,000, with a possible extension approximately on the line CD, if funds will permit; provided that before work is begun by the United States assurance shall be given, satisfactory to the Secretary of War, that the projected railroad between Crescent City, Cal., and Grants Pass, Oreg., will be completed within a reasonable time; and provided further, that local interests shall contribute $100,000 toward the work, and shall furnish, free of cost to the United States, such land as may be required for the operations of the Government in connection with this project. The total amount of the Government's share, $390,000, should be provided in one appropriation.

DAN C. KINGMAN,
Chief of Engineers, U. S. Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS ON SURVEY.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
November 10, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is submitted in review of the district officer's reports on preliminary examination and survey of Crescent City Harbor and vicinity, Cal., with a view to securing a suitable harbor, authorized by the act of July 25, 1912.

2. A report was submitted with reference to Crescent City Harbor under authority of the act of February 27, 1911, which indicated the advisability of considering other possible sites in the vicinity of Crescent City before deciding upon any location for a harbor on this section of the coast, and the present investigation permits of this, as it includes adjacent localities. The district officer invites attention to the previous report, published in House Document No. 720, Sixty-second Congress, second session, for description of locality, commerce, and resources. The commerce reported in 1910 is about 6,000 tons of general merchandise and about 60,000 tons of lumber exported. The district officer then stated that the existing commerce is so small that the improvement of the harbor could be justified only on the ground of prospective commerce as a result of harbor improvement. He reports the existing standing timber in Del Norte County at about 17,000,000,000 feet. This would be the principal commodity to be handled in the harbor. There are reported, however, extensive undeveloped mineral resources, and, moreover, as the country is cleared of timber the dairy industry is being developed.

3. The localities considered are (1) Crescent City, (2) Point St. George (or Wooleyport), (3) Preston Island, and (4) Lakes Earl and Talawa. The investigations of the district officer led him to the conclusion that of the several localities Crescent City Harbor is the

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best natural landing and the one that could be most easily and economically improved and extended. It is well protected from all points north of west, but it is open to the southwest, and during storms from that direction vessels lying in the harbor are not safe. At times during local fair weather very heavy swells reach this shore from storms at great distances, and these produce destructive waves.

4. A plan of improvement is proposed involving a breakwater extending from Battery Point to Fauntleroy Rock and a jetty or sand barrier from Whaler Island to the high-water beach line, the entrance to be between Fauntleroy Rock and Whaler Island. The area protected by these structures would be 460 acres at high-water line, 361 acres at mean lower low water, 148 acres of which has a depth of 18 feet or more, and 81 acres a depth of 24 feet or more. The harbor is susceptible of extension by the excavation of a basin in the lowlands lying about Elk Creek. Stone of a suitable quality is scarce in the vicinity of the proposed work, but may be obtained at distances not too great.

5. The estimated cost of the proposed breakwater and Whaler Island barrier is $1,828,750. For several years after completion considerable deterioration of the work is expected, due to the very heavy wave action to which it would be subjected, and the district officer estimates that for a period of four years the cost of maintenance will average $35,000, and that thereafter it will diminish. Local interests have indicated their willingness to contribute toward the construction of a harbor.

6. The district officer states that there is no other harbor along this coast for a distance of 100 miles in either direction; that the timber, mineral, and agricultural resources of northern California and southern Oregon are seeking an outlet at this point; and that the work is necessarily expensive and beyond the resources of the limited locality and can only be effected through cooperation with the General Government. The contribution proposed by the locality is the limit of its resources. The district officer, who is also division engineer, reports the locality as worthy of improvement by the United States at a cost of $1,828,750 for construction and $35,000 per year for four years, for maintenance, provided that local interests contribute $250,000 toward the work.

7. On August 20, 1914, a committee of the board visited Crescent City, conferred with parties interested in the proposed improvement and inspected the harbor and vicinity. Additional estimates have been secured from the district officer for works both of greater and less extent than those proposed by him. It is found that a harbor having a protected area of about 600 acres with depth of not less than 24 feet, as shown on the map, would cost from $5,833,000 to $8,064,000, depending upon the type of breakwater, while a breakwater as shown from A to C, which would afford considerable protection and later form part of a greater project, if one is justified by commercial growth, would cost $490,000. The district officer believes that this breakwater would be of considerable benefit to existing commerce and would encourage and permit future development.

8. The board has given careful study to this subject in all its phases, including information gained through the courtesy of parties in interest, as well as by its own investigations, with reference to existing physical and commercial conditions at Crescent City and in the

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adjacent or tributary country. It appears quite reasonable to believe that a safe harbor on this section of the coast would be of material advantage to the existing commerce and would encourage further development. It would also be of value to general navigation on the north Pacific by affording a place of refuge for vessels in distress. Crescent City is believed to be the best location for such a harbor on this section of the coast.

9. The existing commerce is small, and under present conditions must remain so, as the area served is limited to that which can be reached by wagon or tram roads, the nearest railroad being 100 miles distant. Lumber is the principal commodity of export and will continue to be for many years. Imports are now necessarily confined to the needs of the small tributary population. The present harbor facilities consist of a pier and wharf reaching to about 15 feet of water naturally protected from the summer northwest winds but exposed to winter storms from the southwest. The harbor is fairly quiet for six to seven months, and there are few interruptions to the boat service during this period. During the rest of the year the boats continue to operate, but have to lie outside at times on account of high waves. The records show that on 29 trips in the winter months delays were experienced on 15 trips for various periods up to 18 days, the average delay being about 6 days. On the whole it may be said that the existing facilities are fairly adequate for the present small commerce, but wholly insufficient for the much larger tonnage seeking an outlet to the sea at this point.

10. The railroad projected from Grants Pass, Oreg., on the main line of the Southern Pacific, to Crescent City will, if completed, be an important factor in the development of this section of country and add very materially to the prospective need of a harbor at Crescent City. Recent information states that a contract has been let for the construction of this road from Grants Pass to Waldo, a little less than half way, to be completed in 24 months. Little benefit to the harbor can be expected from this road, however, until it is completed to Crescent City. It will be used principally to transport timber and copper ore, although its use would gradually extend to shipments of farm, orchard, and dairy products.

11. There are large tracts of privately owned timber tributary to Crescent City, and the owners of these would undoubtedly be greatly benefited by a good harbor with rail connection with the interior. There are also tributary farther inland large Government forest reserves and much stress has been laid on this fact by advocates of the improvement, who stated that these reserves contained a great quantity of timber awaiting shipment as soon as a suitable harbor was made available. A report[1] from the Department of Agriculture, secured at the request of the board, states that such a harbor at Crescent City with rail connection with the interior would eventually be of considerable value in marketing the Government timber, but the report was not sanguine of any great benefit in the immediate future or until the more valuable privately owned holdings had been disposed of.

12. The first requisite for the development of a business commensurate with the cost of a protected harbor of even moderate size at

[1] See p. 33.

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this locality is the existence of good rail connection with the interior. Without such communication, the commerce must necessarily be limited to a small area. With the assurance, however, that the railroad would be completed within a reasonable time, it is believed that the United States would be justified, with proper cooperation, in providing protection to this harbor by the construction of the breakwater from A to C. Such a structure would materially improve existing conditions. It would afford an opportunity for the development of commerce and would form a part of a more commodious harbor should this be warranted in the future by a commensurate growth of traffic.

13. In view of the foregoing the board is of opinion that it is advisable for the United States to undertake the improvement of Crescent City Harbor and vicinity, with a view to securing a suitable harbor by the construction of a breakwater at a cost of $490,000, approximately as shown on the map by the line AC, with a possible extension, approximately on line CD, if funds will permit, provided that before work is begun by the United States assurance shall be given satisfactory to the Secretary of War that the projected railroad between Crescent City, Cal., and Grants Pass, Oreg., will be completed within a reasonable time, and provided further, that local interests shall contribute $100,000 toward the work, and shall furnish, free of cost to the United States, such land as may be required for the operations of the Government in connection with this project. The total amount of the Government's share, $390,000, should be provided in one appropriation.

14. In compliance with law the board reports that except as contemplated by the above recommendations there are no questions of terminal facilities, water power, or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

For the board:

W. M. BLACK,
Colonel Corps of Engineers,
Senior Member of the Board.

PRELIMINARY EXAMINATION OF CRESCENT CITY HARBOR, CAL.

UNITED STATES ENGINEER OFFICE,
First District, San Francisco, Cal., April 19, 1913.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Preliminary examination of Crescent City Harbor and vicinity, Cal.

1. "Crescent City Harbor and vicinity, California, with a view to securing a suitable harbor" is an item under the head of Examinations and Surveys in the river and harbor act of July 25, 1912, and is assigned to this office for report by department letter of August 3, 1912.

2. A report on preliminary examination of Crescent City Harbor, Cal., was submitted by Col. John Biddle, Corps of Engineers, on July 8, 1911, and is printed in House Document No. 720, Sixty-second Congress, second session. It is there stated "The act of Congress provides

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only for an examination of Crescent City Harbor. Unless it can be held that this will permit an examination of the coast for at least several miles above Crescent City it is recommended that no further action be taken at present, but that recommendation be made to Congress to authorize an examination to include Crescent City Harbor and the vicinity."

3. The present examination is made pursuant to the above recommendation which was adopted by Congress, and this further report will therefore be concerned with other points in the vicinity of Crescent City where harbor construction may be possible, and with developments that have taken place since the date of the last report.

4. Reference is made to Col. Biddle's report of July 8, 1911, for description of locality, references to previous examinations and reports, present conditions including commerce and resources, suggested improvements, and conclusions.

5. Under the last head it was stated that "A well-protected harbor of reasonable size is considered desirable along this part of the coast for commercial purposes if it can be obtained at a justifiable cost and if the communities interested contribute to its construction."

6. Other points in the vicinity of Crescent City that have been suggested as possible harbor locations are (1) Point St. George (or Wooleyport), (2) Preston Island, and (3) Lakes Earl and Talawa.

7. At Wooleyport the conditions are similar to those at Crescent City. A projecting point and reef affords protection against north and northwest storms and forms a rocky cove exposed from west to south whence come the great rollers of the winter storms. The methods of improvement would be the same as at Crescent City, namely, the construction of a breakwater that would give additional protection toward the south and west and probably some dredging and removal of projecting rocks. Deep water here lies closer to shore than at Crescent City, but otherwise the improved harbor would offer no advantages over one at Crescent City.

8. Preston Island is more exposed than either Crescent City or Wooleyport, and a greater length of breakwater would be required. Deep water lies close to shore, but the shores are high and rocky and not suitable for harbor purposes. Local interests propose to construct a cableway landing where vessels can lie at anchor off shore in smooth weather and receive lumber cargoes by a cableway until better harbor facilities are provided in the vicinity. This will permit the loading of vessels of deeper draft than those the Crescent City wharf can now accommodate, but the difficulties and delays due to bad weather will remain.

9. Lakes Earl and Talawa lie about 4 miles north of Crescent City. They are lagoons with a connecting channel and are separated from the sea by a narrow strip of sand dunes and beach. During the winter rains a small opening breaks through the beach to the sea, but this is filled up by the waves as soon as the rains cease. In the lakes the greatest depths range from 10 to 20 feet, and there are wide flats of shoal water, the total area being from 10 to 12 square miles. The beach appears to be stable in position and slope, although there is probably some lateral motion of sand, depending on the prevailing winds. Depths offshore increase uniformly to 30 feet at one-half mile and to 50 feet at 1 mile. Partial protection to this stretch of beach on the southwest is afforded by St. Georges Reef, extending

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about 6 miles offshore from St. Georges Point and consisting of a series of isolated rocks in water from 8 to 10 fathoms deep. The great waves from the southwest spend much of their energy on this reef and reach the beach with diminished effect. A deep channel lies between the reef and the shore, and is generally used by coastwise vessels. A good landlocked harbor may be constructed at Lake Talawa by building two converging jetties, with the outer ends about 800 feet apart in 35 feet of water, and then dredging a channel through the sand spit into the lake. The outer harbor between the jetties would still the entering waves and protect the inner channel from wave wash. The shores of the lakes are low and flat and therefore suitable for terminal facilities and industrial sites. The lakes are of ample area to provide for future harbor development to any desired extent. The cost of such a harbor would probably be no greater than that of the smaller harbors at Crescent City or Wooleyport, although these actual costs can not be determined without detailed surveys at each of the points considered. At Crescent City or at Wooleyport the best that can be expected is a small, rocky harbor partially protected by breakwaters and incapable of future expansion. At Lake Talawa a landlocked harbor capable of indefinite expansion can be secured. The people most interested in a harbor state that they want the best harbor that can be secured irrespective of its exact location, although the people of Crescent City would prefer to have it at that point.

10. Since the previous report was rendered there has been great activity in relation to railroad construction in this region.

11. A company has been formed and partially financed, location surveys have been made, options on right of way have been secured, and construction has begun on a railroad from Grants Pass, Oreg., to Crescent City. This road will tap the rich Rogue River Valley and the Klamath River Valley and will make all of northern California and southern Oregon tributary to Crescent City. Large bodies of copper ore have been developed in this region but have not been worked, owing to lack of transportation. The railroad will permit the operation of these mines.

12. The connecting link in the Northwestern Pacific Railroad will be completed during the year 1914, and the road will then be open from San Francisco to Trinidad, the latter point being about 75 miles from Crescent City. Surveys are being made for extending this road northward through Crescent City to Portland, Oreg. On both of the projected roads there are immense quantities of timber that will find an outlet at Crescent City if shipping facilities can be provided.

13. There is every indication, therefore, that the commerce of Crescent City, which is now restricted to the needs of the immediate vicinity and to the capacity of the little coastwise steamers that can reach the wharf, will be greatly increased even without a suitable harbor, and that the construction of a harbor will, with the advent of the railroads, lead to extensive commercial, industrial, and agricultural development in the region that will become tributary to such a harbor. Much of this region is now undeveloped owing to lack of transportation, and the developed portions find their nearest ocean outlets at San Francisco, over 300 miles to the south, or at Portland, Oreg., an equal distance to the north.

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14. City authorities of Crescent City have secured offers of contributions from local interests amounting in all to about $200,000 to be turned over to the United States for harbor construction, and they estimate that this sum might be increased to $250,000 if required. The former sum, $200,000, would be but a small portion of the amount that will probably be required for harbor construction, perhaps not over 10 per cent of the total, but it is a large contribution from the small community that is immediately and directly interested in the improvement of the harbor. Local interests have also offered the use of stone from quarries without royalties, a free right of way for railroad tracks from quarries to breakwaters, and deeds free of cost to the United States for the land necessary in connection with the harbor work. While these offers of cooperation are not now in definite or conclusive form, it is believed that they will be fulfilled if made conditions to the work being undertaken by the United States.

15. The desirability and value of a harbor on this part of the coast seem to be evident. The advisability of undertaking the work and the best location for the harbor can not be fully determined without detailed surveys of Crescent City harbor, Wooleyport, and Lakes Talawa and Earl, and the preparation of plans and estimates. If the cost should prove to be reasonable in consideration of the benefits to be derived therefrom, it is my opinion that the construction of a harbor in the vicinity of Crescent City, Cal., would be a work worthy of being undertaken by the United States.

16. It is therefore recommended that the necessary surveys and preparation of plans and estimates be authorized.

THOS. H. REES,
Lieut. Col., Corps of Engineers.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
May 19, 1913.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. For reasons stated herein, particularly on account of the local cooperation offered, the board concurs with the district officer, who is also division engineer, in recommending a survey in order to determine the extent and advisability of the improvement and the amount and character of cooperation that may be expected.

For the board:

WM. T. ROSSELL,
Colonel, Corps of Engineers,
Senior Member of the Board.

SURVEY OF CRESCENT CITY HARBOR, CAL.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
First District, San Francisco, Cal., January 31, 1914.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Survey of Crescent City Harbor and vicinity, Cal.

1. This is a report on the survey of Crescent City Harbor and vicinity, Cal., with a view to securing a suitable harbor, authorized

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by the river and harbor act of July 25, 1912, and ordered by letter of the Chief of Engineers of May 23, 1913.

2. A preliminary examination report was submitted April 19, 1913. The general commercial and industrial situation is at present much the same as was reported therein except that the prospects for the early construction of a railroad between Grants Pass and Crescent City appear to be less favorable. It is believed that the interests concerned are awaiting the action of the United States in regard to harbor construction at Crescent City.

3. The survey of Crescent City and vicinity was made by a field party under the direction of Mr. Morton L. Tower, assistant engineer. This survey covered the coast from Crescent City to Point St. George and the areas of Lakes Talawa and Earl and the adjacent ocean shore.

4. Omitting his description of the methods employed in the survey, Mr. Tower's report is as follows:

Lakes Earl and Talawa sites.—Lake Talawa is a small lagoon or lake covering, at the elevation when surveyed, about 369 acres, lying behind the sand ridge forming the ocean beach. It is connected by a natural channel, about 450 feet wide, with Lake Earl, which has an area of 2,443 acres. The westerly shore of the lake is drifting sand dunes, containing a small proportion of large gravel. On the eastern shore the sand is covered with soil and vegetation. The lakes receive the drainage from a comparatively small area lying west of Smith River. During periods of high tides and winter storms the ocean waves break across the sand ridge into the lakes. This accumulated sea water and fresh water from the large rainfall of the locality gradually raises the water level of the lakes until it overtops the sand ridge and scours out a channel, quickly lowering the lakes until the sea fills up the entrance and the cycle is repeated. During late years the dairy farmers on the borders of the lake open the entrance whenever the water reaches an elevation which covers the pasture lands. The waters of the lakes are brackish, but do not support any growth of shellfish or other animal life typical of sea water. At the time of the survey the elevation of the water surface of the lakes was 7.28 feet above the plane of mean lower low water. The depth of water was generally about 7 feet, with only a small area below the plane of reference for the coast surveys.

An attempt was made to sink test holes between the lakes. At elevation −12 feet a layer of coarse gravel was encountered which resisted all efforts to penetrate with the light apparatus available. There were no means available for sinking a test hole deeper and the funds allotted for the survey would not permit of further testing subterranean conditions. Owing to the refusal of the well-drilling tools which were available to penetrate the gravel bed found, it would be important that further test holes be made before any reliable estimate were made for harbor construction at this site, which will involve excavation.

Wooleyport site.—Wooleyport is a small area partially protected by reefs from a portion of the ocean waves. The protection from all storms north of west is complete, being afforded by Point St. George and the long reefs reaching offshore to Northwest Seal Rocks. From the south the protection is limited, the reefs are partly submerged and, lying close to shore, do not keep off the ocean waves sufficiently. The protected area covers 113 acres outside the 12-foot below-water contour. This small area is studded with rocks which indicate that dredging would be very expensive. It would be desirable to create protection from westerly and southwesterly storms by sea walls or breakwaters along the reefs. A land company proposed to create a harbor here by shutting out a portion of the swell but leaving the opening south of Castle Rock, which would face the worst of the winter storms. A small port with an opening north of Castle Rock and the entrance protected by it from the southwest could be made. It would involve some subaqueous rock excavation. Owing to the very small area possible to protect and the necessarily expensive rock excavation required, it is not considered that a harbor capable of affording protection necessary for ships to lie at wharves during all seasons is feasible at this site. Any small harbor located on this exposed shore, even with a very narrow entrance, will be subject to a heavy ground swell or surge during periods of rough ocean, which will render necessary very heavy wharf construction and care in mooring vessels during rough periods.

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Crescent City Harbor site.—Crescent City Harbor is by all means the best natural landing and the harbor site most easily improved and extended on this portion of the coast. The protection from all storms north of west is complete, being afforded by the headland extending to Point St. George. The offing for several miles south is smooth and protected during the summer northwest winds. The harbor is open to the southwest, and during periods of storm from that direction is not safe for vessels. From the southeast, the distance or fetch being limited by the high shore down the coast, the protection is adequate. Storms on this portion of the Pacific coast generally commence with a high southeast wind which gradually swings around to southwest or west and are generally accompanied by a very heavy sea. At other times, during periods of local fair weather, a very heavy swell will reach this shore from storms at great distance off the coast. The most destructive waves are the result of these distant offshore storms. These waves or swells are marked by great distance between crests, or wave lengths, and they generally have a higher velocity than waves caused by local storms, hence their destructive power. The effect of these great waves on small harbors is to create surges or ground swells, which render the mooring of vessels difficult, and make it impossible to hold them close to wharves without damage to wharf and vessel. It is a well-known fact that an entrance, narrow compared with the harbor area, generally tends to lessen the objectionable ground swell.

Immediately south of Crescent City a sandy beach extends for about 5 miles. This beach is composed of sand of very small grains, smooth, round, and very heavy, containing considerable mineral. It naturally assumes very flat slopes, and when saturated is probably a proper quicksand. There is a general belief that this sand would tend to fill up any harbor created at this site. I can see no reason for this, as there is no evidence that material constant changes in the sand or that a littoral travel exists. The beach lines are apparently as they were when the settlement of Crescent City was first established. The permanence of the bottom about the outer edge of Whaler Island is established by the growth of welds and shells on the rocks, indicating the absence of any considerable sand movement outside of that islet.

For the improvement of this site the following construction is proposed:

A breakwater extending from Battery Point to Fauntleroy Rock along a line selected over the reefs and rocks in place which will afford the cheapest construction and a jetty or sand barrier from Whaler Island to the high-water beach line. The entrance will be between Fauntleroy Rock and Whaler Island. The area protected by this construction will be as follows: Outside of ordinary high-water line, 460 acres; outside of mean lower low-water line, 361 acres; with a natural depth of 12 feet at mean lower low water, or greater, 239 acres; with a natural depth of 18 feet at mean lower low water, or greater, 148 acres; with a natural depth of 24 feet at mean lower low water, or greater, 81 acres. There is no evidence that a larger portion of the area covered by the shoal water could not be dredged to a depth sufficient for commerce without encountering rock, but, owing to the general rocky nature of the vicinity, rock is liable to be found anywhere a few feet below the sandy bottom. Where the rock is now exposed in the harbor it is plainly marked by the nature of the growth of grass, and such areas have been indicated on the map.[1]

To provide for an inner harbor, should the ground swell prove to be too great in the area protected by the proposed breakwater, it is suggested that a basin could be excavated in the lowland about Elk Creek. As a result of borings made it is evident that rock will be encountered at about elevation 25 feet below datum.

Stone supply.—Stone of a quality desirable for jetty construction is scarce in the vicinity of the proposed work. The larger portion of the country rock is a metamorphic sandstone, broken, and the strata distorted by pressure and earth folds. Stone of this quality is abundant. A quarry site on the left bank of Smith River in section 13, township 17 north, range 1 west, Humboldt meridian, was visited. This quarry could be reached by rail and would require rebuilding on an old grade about 2 miles of track. The same quality of stone is found in great abundance in the bluffs south of Crescent City. A good chance of opening a quarry exists in section 35, township 16 north, range 1 east, Humboldt meridian. This would require extending the logging railroad of Hobbs, Wall & Co. about 2 miles through level fields along the foot of the bluff. A price for stone was not obtained from owners of these quarries.

[1] Not printed.

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Stone from these sites, as well as from rocks along the coast, were tested and found to have about the same specific gravity, weighing about 165 pounds per cubic foot.

At the junction of Mill Creek and Smith River a fine ledge of heavy, close grained igneous rock is exposed and would form an easily developed quarry. It would require the extension of a railroad from the present end of Hobbs, Wall & Co.'s logging road, up Smith River, 7 miles. This stone would form an excellent material for the superstructure of the proposed outer breakwater, but if the road is not constructed by logging interests, its cost would render the price prohibitive for jetty construction alone.

The larger of the rocks and islets along the coast from Crescent City north to Point St. George are composed of stone which would be suitable for the substructure for the proposed breakwater and for the construction of the other rock walls proposed. It is thought by saving all of the larger pieces during quarry operations, a large quantity for the superstructure of the breakwater could be obtained from the same source, and perhaps all of it. It is thought that many of these rocks, including Whaler Island and Castle Rock, are still the property of the United States, and it is suggested that they be withheld from sale or other transfer from the public domain until it is determined whether or not they be needed for the development of the harbor.

Whaler Island, Preston Island (private property), White Rock, and portions of Castle Rock would form an adequate and very cheap supply of stone for jetty construction. The material could be loaded directly on barges from the quarry pits and delivered in the work at a very low cost. The work could be carried on under the present condition of the harbor during the whole of summer season.

5. The report includes also a plan and estimate for an inner basin along Elk Creek. Such an inner basin may be required by the future development of commerce, but it is not deemed necessary at the present time, and is therefore left for future consideration. The outer harbor will be sufficient for the needs of this locality for many years. Mr. Tower is an engineer of extended experience in harbor work on this coast, and his opinions and recommendations are given great weight.

6. In the light furnished by the complete surveys now available it appears that there is no place on the coast in the vicinity of Crescent City better suited for the construction of a small commercial harbor at moderate cost than is Crescent City Harbor itself. Plans and estimates are therefore prepared and submitted for this locality alone.

7. Maps[1] of the survey, in two sheets, are submitted herewith. One shows Crescent City Harbor and the proposed location of breakwaters. The other shows the coast from Preston Island to Point St. George. Estimates are based on the location of breakwaters as shown by the full line. An alternative location that would not materially change the estimate is shown by a dotted line. The substructure up to mean lower low water will consist of quarry run stone in pieces up to 10 tons weight, with slopes on the ocean side of 2 on 3 from bottom to elevation —15, and 1 on 6 from —15 to mean lower low water; and on the harbor side 2 on 3 to elevation —12, and thence 1 on 3 to mean lower low water. Superstructure of selected stone weighing up to 20 tons with side slopes of 1 on 2 surmounted by a concrete cap 2 feet thick and 20 feet wide at elevation +15. The Whaler Island barrier, in shallow water and less exposed, will be built of quarry run stone up to 10 tons with slopes on ocean side of 1 on 3 and on harbor side of 1 on 2 surmounted with a similar concrete cap at elevation +13.

[1] Not printed.

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8. *Estimate of cost:*

Substructure, 770,000 tons, at $1.40	$1,078,000
Superstructure, 150,000 tons, at $2.20	330,000
Concrete cap, 4,050 linear feet, at $20	81,000
Whaler Island barrier:	
90,000 tons, at $1.40	126,000
Concrete cap, 2,375 linear feet, at $20	47,500
	1,662,500
Engineering and contingencies, 10 per cent	166,250
Total	1,828,750

9. The dimensions and slopes given above for the proposed structures are those believed to be necessary for stability and permanency. Experience during actual construction may indicate some possible modifications that will lessen the cost, but it would not be safe to lower the estimates without that experience. Structures of less volume and weight might stand for several years, but then the rebuilding of the breakwaters would make the total cost greater than the present estimate. For several years after completion, considerable deterioration of the work must be expected. Heavy stones will be dislodged and the slopes will be torn down by the tremendous seas, and the damage once started will progress rapidly unless promptly repaired. It is therefore essential that provision be made for constant maintenance until a compact mass with stable slopes has been secured. It is estimated that this maintenance will require an average expenditure of $35,000 per year for four years after the completion of the work and that thereafter the cost of maintenance will rapidly diminish.

10. Local interests have expressed, through a resolution of the board of trustees of Crescent City (copy herewith), their ability and willingness to contribute $250,000 as a special fund to be applied by the United States to the construction of this harbor. While this is only 13.6 per cent of the initial cost of the work, it is still a considerable sum to be raised in the community immediately adjacent to the proposed harbor, and it appears to be the limit of their resources.

11. The conclusion stated in Col. Biddle's preliminary report of July 8, 1911, that (par. 19) "a well-protected harbor of reasonable size is considered desirable along this part of the coast for commercial purposes if it can be obtained at justifiable cost and if the communities interested contribute to its construction" is believed to be well founded and to be supported by subsequent investigations and surveys. There is no other harbor along this coast for distances of 100 miles in either direction. The timber, mineral, and agricultural resources of northern California and southern Oregon are seeking an outlet at this point and the construction of a connecting railroad will, in all probability, follow or accompany the creation of a harbor. The construction of a breakwater that will withstand the great waves of the northern Pacific Ocean is necessarily an expensive undertaking that is beyond the resources of any limited locality, and that can be accomplished only by the General Government with such cooperation as the locality can afford. The work proposed will provide a well-protected harbor of reasonable size, and it is capable of future extension by dredging an inner basin along Elk Creek. It can be obtained at a justifiable cost considering the difficulties of construction on this

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exposed coast, and the communities interested will contribute toward its construction to the extent of their resources.

12. This locality is therefore deemed worthy of improvement by the United States to the extent and in the manner above stated at a total initial cost to the United States of $1,578,750 for construction, and a maintenance cost averaging $35,000 per year for four years, provided that an additional $250,000 be contributed toward the work by local interests.

13. The work can be economically completed in five years, thus requiring five annual appropriations of $315,750 each. The $250,000 to be contributed by local interests should be furnished and made available before the work is commenced, the greater sum in the first year being necessary to provide the plant and equipment for starting the work.

THOS. H. REES,
Lieut. Col., Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors on Survey, see p. 5.]

RESOLUTION OF BOARD OF SUPERVISORS OF DEL NORTE COUNTY, CAL.

Whereas it is by the board of supervisors of Del Norte County, Cal., deemed to be for the best interest of said county, and the citizens, taxpayers, and inhabitants thereof, that the legal representatives and officials of said county cooperate in every feasible way toward securing a favorable report upon and an adequate appropriation for the construction of a harbor in the vicinity of Crescent City, Cal., but within Del Norte County, Cal.; and

Whereas the above and foregoing resolution is by the undersigned deemed to be timely and proper, and worthy of cooperative indorsement;

Now therefore be it resolved and the board of supervisors of Del Norte County, Cal., do hereby resolve—

First. That the above and foregoing resolution be, and the same is hereby, indorsed.

Second. *Be it further resolved*, That the legal representatives of Del Norte County stand ready and willing to assist in the raising of any subsidy that may be desired or required by the United States Government along the lines indicated by the above and foregoing resolution, and irrespective of the exact location that may be selected for a harbor site by the United States Government, provided that the same shall be within Del Norte County, Cal.

Third. *Be it further resolved*, That a certified copy of this indorsement be forwarded to Lieut. Col. Thos. H. Rees, of the United States Engineer's Office, 401 Customhouse, San Francisco, Cal.; also a like copy thereof to the Board of Engineers of the War Department, and to the House of Representatives and Senate of the United States at Washington, D. C.

Done in special called session this 7th day of January, 1914.

(Signed and approved) WEST DULEY,
Chairman Pro Tempore of the Board of Supervisors of said County of Del Norte.

Attest:
[SEAL.]

W. L. NICHOLS,
County Clerk and ex officio Clerk of said Board with the seal thereof hereto affixed.

RESOLUTION OF BOARD OF TRUSTEES OF CRESCENT CITY, CAL.

Whereas the board of trustees of the city of Crescent City heretofore and on November 3, 1913, passed a certain resolution addressed to the public generally, recommending and urging that harbor improvements be constructed at or

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in the vicinity of Crescent City, Cal., along adequate, permanent, and substantial lines; and

Whereas on, to wit, November 10, 1913, the board of supervisors of Del Norte County, Cal., passed a similar resolution and recommendation; and

Whereas paragraphs third of each of said resolutions proper recite, among other things, "that it is believed that a substantial subsidy can, and if desired or required by the United States Government, will be raised for and given to the United States Government to aid in such construction;"

Now therefore be it resolved and the board of trustees of said city do hereby resolve—

First. That if the United States Government shall authorize an appropriation for and commence construction upon the harbor site at Crescent City, Cal., on or before January 1, 1915, the cost of which shall be at least $1,000,000, and upon condition that a substantial subsidy be raised and given to the United States Government to assist in such construction, then and in such case the city of Crescent City, through the legal representatives and officers thereof, shall and will exercise their best efforts to raise a subsidy therefor in the sum of at least $200,000, and if the cost thereof shall be one million and a half or over, upon a like condition, that then and in such case said city as aforesaid shall and will exercise their best efforts to raise a subsidy therefor in the sum of at least $250,000.

Second. *Be it further resolved*, That the said city of Crescent City and the officers and representatives thereof stand ready and willing to undertake the burden of actually raising such subsidy in the form and along the lines that shall be required by the United States Government as soon as the desired method of so doing shall be made known to said city of Crescent City by the United States Government.

Third. *And be it further resolved*, That said city shall use its best efforts to procure the use of land on shore necessary for starting work and for shops, yards, and laborers' quarters, free of cost to the United States Govenment.

Also that the matter of cost of quarries shall be inquired into with the view of obtaining the use of adequate, substantial, and convenient quarries without the payment of excessive royalty for the use thereof.

Fourth. *And be it further resolved*, That a certified copy of this resolution be forwarded to Lieut. Col. Thos. H. Rees, of the United States Engineer's Office, 401 Customhouse, San Francisco, Cal.; also a like copy thereof to the Board of Engineers of the War Department and to the House of Representatives and Senate of the United States at Washington, D. C.

Done in open regular session this 5th day of January, A. D. 1914.

(Signed and approved) J. R. BREEN,
President of the Board of Trustees of said city of Crescent City.

Attest:
[SEAL.]

W. L. BRADLEY,
City Clerk and ex officio Clerk of said Board with the seal thereof hereto affixed.

SUPPLEMENTAL REPORT ON CRESCENT CITY HARBOR, CAL.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
First District, San Francisco, Cal., May 15, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Supplemental report on Crescent City Harbor, Cal.

1. The additional information desired by the Board of Engineers for Rivers and Harbors in indorsement of April 17, 1914, is as follows:

The cost of creating a harbor at or near Crescent City having a sheltered area of not less than 600 acres, with a depth of not less than 24 feet, and whether a harbor of this area and depth can be created at smaller cost at any other locality in the vicinity.

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2. When visiting this district last August the board requested the following information:

(*a*) Costs per 100 linear feet of rubble mound breakwater in different depths of water;
(*b*) A map and profile of the proposed railroad from Crescent City, Cal., to Grants Pass, Oreg.;
(*c*) A statement of the arrivals and departures of vessels at Crescent City, showing the delays due to bad weather.

3. There are submitted herewith a map showing the location of breakwaters which, supplemented by dredging, will create a harbor at Crescent City having a sheltered area of 600 acres, with a depth of not less than 24 feet, and detailed estimates of the cost of constructing this harbor, both for the rubble mound type of breakwater throughout and for the concrete caisson type of construction in deep water with rubble mound for the shoaler portions, and of the cost of dredging necessary to provide within the sheltered area an area of 600 acres with a depth of not less than 24 feet. The area to be dredged is that lying between the 24-foot and 12-foot contours. In lesser depths the gain of area by dredging costs more than gain of like area by moving the breakwaters seaward, and this limits the depth of economical dredging for increased area at this locality.

4. The estimated cost of this harbor with the rubble mound type of breakwater is $8,064,000 and with the proposed concrete caisson type of breakwater, $5,833,000, showing a difference of $2,231,000 in favor of the caisson type. In either case the work, if undertaken, should be prosecuted at a rate involving the expenditure of $1,000,000 per year.

5. The surveys for the original report on this subject included the coast as far north as Wooley Port and also the vicinity of Lakes Earl and Talawa, about 6 miles north of Crescent City. The Coast Survey charts, both north and south of Crescent City, have also been carefully studied, and there has been found no other locality in this vicinity where a harbor of the proposed area and depth can be created at smaller cost than at Crescent City.

6. The costs per 100 linear feet of rubble mound breakwater in varying depths are shown on the diagrams [1] herewith, one for the outer breakwater and one for the barrier at Whaler Island. The estimate originally prepared without the diagram for the rubble mound breakwaters was $8,064,000. This was checked by the use of the diagram, which gave $8,091,000, both including dredging.

7. There are submitted location map [1] (in 4 sheets) and a condensed profile [1] of the proposed Crescent City–Grants Pass Railroad, and for comparison a condensed profile [1] (2 sheets) of the Southern Pacific Railway, San Francisco–Portland, and profile [1] (1 sheet) of the proposed new route via Klamath Falls, which latter will probably become the main line of the Southern Pacific Railway when completed. The Crescent City–Grants Pass location compares favorably with the other lines as to elevation and grades, but has some sharp curves.

8. Information concerning delays of vessels at Crescent City due to bad weather has been furnished by the San Francisco Merchants' Exchange and by Mr. W. J. Hotchkiss, and is submitted herewith.

9. It is believed that the larger harbor above described will ulti-

[1] Not printed.

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mately be justified by the growth and development of the surrounding country, but that the smaller harbor originally proposed, with an entrance between Fountleroy Rock and Whaler Island, will suffice for all prospective commerce for 15 or 20 years. With a view to future requirements, the breakwater for the smaller harbor should follow the line now proposed for the larger harbor as far as Fauntleroy Rock, leaving the question of further extension for future determination.

THOS. H. REES,
Lieut. Col., Corps of Engineers.

REPORT ON CONCRETE CAISSON METHOD FOR BREAKWATER.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
First District, San Francisco, Cal., May 15, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Concrete caisson method proposed for Crescent City breakwater.

1. With reference to the supplemental report on Crescent City Harbor, of May 15, 1915, the following description of the proposed concrete caisson method is submitted.

2. The rubble-mound type of construction will be used out to 23 feet lump opposite rock 16 at bend in breakwater. This will give protection for continuing the work by concrete caisson method as follows:

3. A foundation of rubble stone in sizes up to 3 tons will be built with a thickness of not less than 5 feet. Stone will be placed by dumping from barges and the surface will be leveled off with smaller stone thrown in by hand from deck barge, testing with a sounding rod until an even level surface is secured at least 12 feet wider than caissons and with natural side slopes. On rocky bottom the thickness will be only sufficient to give a level surface as a foundation for the caissons. In deeper water the foundation will be raised to a level surface at a depth of about 30 feet at mean lower low water.

4. Caissons will have a height 8 feet greater than the depth of water at mean lower low water, in which they are to be placed and will be designed to float with a submergence of not more than 0.8 and a free board of not less than 0.2 of the height. In plan they will be 31 feet wide and 43 feet long. The outer walls will be about 1 foot thick, and interior cross walls, spaced 6 feet on centers both ways, will divide them into compartments about 5 feet square in the clear at the bottom and 5 feet 4 inches square in the clear at the top. The cells will have floors of concrete at the bottom and hatch covers of wood at the top.

5. Caissons will be built on barges alongside the mixing plant on wharf and when set will be towed out to deep water where sea cocks will be opened thus tipping the barge and launching the caisson, which will be towed to its place in the breakwater at high tide, filled with water and sunk upon its foundation. When finally set in place the hatch covers will be removed and all the cells will be filled with stone which will crush down the floors in the bottom and key the caisson to

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its foundation. Also if the foundation is undermined by the washing away of sand the stone will run down out of the cells and fill the resulting voids without disturbing the caisson itself. Heavy stone up to 6 tons will also be dumped along the seaside of the caissons to prevent undermining. This stone should be banked up about one-third the height of the caisson with slope of 1 on 2. Smaller stone up to 2½ tons weight will be dumped along the harbor side of the caissons and banked up one-fourth their height with slope of 1 on 2.

6. Steel rods will be used to tie the outer forms and will remain in the concrete as reinforcement. Outer forms will be built in 2-foot by 6-foot by 6-inch panels to be laid up one course in advance of the concrete. The forms for cells will be boxes without bottoms made in sections 2 feet high, to fit the taper of cell which increases from 5 feet square at the bottom to 5 feet 4 inches square at the top, with corners beveled.

7. The weight of the largest caisson will be about 1,300 tons and the barges must be strongly built to carry this load on the middle third without undue sagging and to launch the load when water is admitted. Scow barges about 120 feet long, 50 feet beam, and 15 feet deep will be required. They will draw probably 4 feet light and 11.5 loaded, with a free board of 3½ feet.

8. Two wharves with a slip between them will be built at Battery Point. One wharf will contain the concrete mixing and handling plant and the other the forms and handling derrick.

OPERATIONS.

9. *Barge No. 1.*—Pay the deck amidships with slush or soap. Lay a flooring of 1 inch by 6 inch T. & G. cross ship, not fastened, covering 32 feet by 44 feet. Lay tarred roofing paper, with lapped edges tacked down. Set accurately in their places the bottom floors of the cells. These will be of concrete 2 feet thick. Floors will be 5 feet 4¼ inches square, which will give a bearing of 2 inches on the concrete at all sides. Stud the 1-inch floor with tenpenny nails spaced about 6 inches but not driven through. Set the bottom course of box forms on the cell floors, spacing them accurately and seeing that the cell floors project equally 2 inches on all sides. Set the lower course of panels for the outside forms and place the tie rods as follows: The top corners of all panels are cut away so that a bolt will lie in the notch at the joint flush with the top edge. The tie rods are 1 inch diameter, upset and threaded at the ends and connected with the end bolts by sleeve nuts. The sleeve nuts will lie 4 inches clear inside the face of concrete and the end stud bolts will be well paraffined to permit their withdrawal after the concrete is set. Large cast-iron washers on the end bolts will bear against all four corners of adjacent panels. In the lower course extra bolt holes will be cut in ends of panels 4 inches above the bottom. This lower course of rods will be supported by wire trivets at their intersections. Other courses will be supported on hangers resting on the edges of the box forms. Hangers will be removed when the next course of box forms is placed and used again.

10. The panels at the ends of the caisson will be 2 inches higher than those at the sides in order that intersecting rods in the same

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course will not interfere. A 2 inch by 6 inch plank will be laid under the end panels for this purpose. The corners will be filled in by small panels shaped to the corners of the caisson.

11. Pour concrete in layers 1 foot thick, or two layers to each panel height. On the first layer of each panel height lay reinforcing rods of ¾-inch twisted steel bars in pairs. Pour second layer of concrete to within 1 inch of bottom of tie rods and at the same time lay next course of box forms and panels and crosstie rods. The longitudinal tie rods will be placed last.

12. Repeat the foregoing operations until the desired height is reached. At the proper height place square frames of 2 inch by 6 inch plank around the upper box forms, with fillers in the beveled corners, thus forming a seat or bearing for the hatch covers.

13. Move barge *No. 1* to the outside of the form pier and bring in *No. 2*, on which build the second caisson in the same manner.

14. When the concrete is sufficiently set on barge *No. 1*, remove the forms and stack the pieces in inverse order of use on the pier ready for barge *No. 3*. On the side and end walls lay a gunwale of 10 inch by 10 inch timber, bolted down by means of stud bolts which have been set in the concrete with nuts buried. To the gunwale timbers fasten necessary chocks and cleats. These gunwales will increase the freeboard and will hold the water which is pumped on deck and allowed to run through holes in hatch covers when filling and sinking the caisson. Holes may be plugged to preserve proper trim while sinking.

15. Hatch covers for cells are of wood 6 inches thick, through bolted edgewise, and calked. Set them in place and calk the edges. Each should have a ringbolt at center for handling with derrick.

16. Fill all vacant bolt holes with cement mortar well rammed.

17. When the concrete is thoroughly set and strong (say 20 days) tow the barge out to deep water and anchor by a bridle from bow and stern on port side (say). Make towline from tug fast to bridle from bow and stern cleats of caisson on starboard side. Open sea cocks of barge, men then leaving in small boat. Take a strain on the towline and when the barge settles and heels over go ahead strong and pull the caisson away from the barge. The strain on the anchor line will help to right the barge when free, but if it capsizes completely it can easily be righted in deep water when full of water.

18. Meanwhile the foundation has been prepared and leveled. At high tide tow the caisson to proper place and pump water into the cells until it grounds. Water is introduced through 3-inch diameter holes bored in hatch covers and stopped with wooden plugs till needed.

19. Bring derrick barge alongside and remove hatch covers, gunwales, fenders, etc. Fill bolt holes with cement mortar. Bring stone on derrick barge and dump from skips into cells of caisson until full. Stone will crush down the bottom floors and fill voids or hollows in foundation. Dump stone also against both sides of caisson as above described.

20. Meanwhile the barge has been righted, pumped out, and towed back to wharf for a new load.

21. When barge *No. 2* is loaded it is replaced by *No. 3* which uses the forms removed from *No. 1*, and when *No. 1* returns it uses the

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forms removed from *No. 8*, and so on. If more rapid progress is desired a fourth barge and another set of forms could be provided.

22. Caissons should remain open for one season to observe settlement. Soundings should be taken after every storm, and any deficiency of stone either in cells or at sides of caissons should be promptly replaced.

23. Caissons should be placed in close contact when possible, but when there is any swell it will be necessary to fend off the floating caisson by rope fenders. In suitable forms, build the concrete side walls in this open space and fill the remaining space with stone. It is not expected that caissons can be sunk true to line and level, and offsets of 6 to 12 inches must be accepted.

24. The superstructure will have the same form of cellular construction as the caissons but will be only 19 feet wide and will cover the three middle lines of cells of the caissons. The height will be 6 feet, which will place the top 14 feet above mean lower low water. It will be built from barges alongside, one derrick barge to handle the forms and another to carry the concrete mixing and handling plant and material. The forms will be the same as those used in building the caissons, with the rods but no other reinforcement. No floors or hatch covers will be required. Building the superstructure on each caisson as a unit, there will be required about 60 cubic yards of concrete, which with a good plant can be placed between tides. The cells will be continuous with those of the caisson and will be filled with stone. When well settled the stone in these cells and in the outer lines of cells of the caissons will be leveled off at a surface one foot below the top and this space will be filled with concrete flush with the top.

25. The superstructure will be built first on alternate caissons. For the intermediate caissons there will then be required no end forms and no longitudinal tie rods.

THOS. H. REES,
Lieut. Col. Corps of Engineers.

SUMMARY OF ESTIMATES.

Item.	Caisson type.	Rubble-mound type.
West breakwater	$3,173,000	$4,247,000
East breakwater	2,510,000	3,667,000
Dredging to obtain harbor of approximately 600 acres, 24 feet deep	150,000	150,000
Total	5,833,000	8,064,000

NOTES.—(1) In the caisson type breakwaters, the shore ends (stations 0+00 to 36+00 in the west breakwater and stations 0+00 to 25+00 in the east breakwater) are designed as rubble mounds the same as for the rubble mound type breakwaters. (2) Sizes of rock given in detailed estimates are to be varied as may be necessary to give economical quarry operation. (3) The estimate for dredging is based on the assumption that the necessary area and depth can be obtained without rock removal. This is not certain as depth to rock has not been determined.

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West breakwater.

RUBBLE MOUND TYPE THROUGHOUT (WITH CONCRETE CAP).

Section and location.	Size of rock.	Tons of rock.	Estimated unit cost of rock in place.	Length and estimated unit cost of concrete cap.	Estimated cost of rock section or of concrete cap.
			Per ton.		
Substructure between stations 0+00 and 36+00 and mean lower low water to natural bottom.	Quarry run, 3 pounds to 1 ton.	639,000	$1.20	.....	$767,000
Substructure between stations 36+00 and 77+00 and mean lower low water to natural bottom.	.....do.....	1,456,000	1.20	.....	1,747,000
Settlement of substructure between stations 0+00 and 36+00 (estimated bodily vertical settlement, 3 feet).	.....do.....	123,000	1.20	.....	148,000
Settlement of substructure between stations 36+00 and 77+00 (estimated bodily vertical settlement, 6 feet).	.....do.....	322,000	1.20	.....	386,000
Superstructure stations 0+00 to 36+00 and above mean lower low water.	5 to 20 tons.....	105,000	2.00	.....	210,000
Superstructure stations 36+00 to 77+00 and above mean lower low water.	.....do.....	136,800	2.00	.....	274,000
Concrete cap stations 0+00 to 77+00 (cap 20 feet wide and 2 feet thick).	.....	.....	.....	(1)	154,000
Rock-handling plant and opening quarries.	.....	.....	.....	.....	175,000
Total	.....	2,781,800	.....	.....	3,861,000
Engineering expenses and contingencies, 10 per cent.	.....	.....	.....	.....	386,000
Total estimated cost west breakwater, rubble mound type throughout.	.....	.....	.....	.....	4,247,000

[1] 7,700 linear feet at $20 per foot.

East breakwater.

RUBBLE-MOUND TYPE THROUGHOUT (WITH CONCRETE CAP).

Section and location.	Size of rock.	Tons of rock.	Estimated unit cost of rock in place.	Length and estimated unit cost of concrete cap.	Estimated cost of rock section or of concrete cap.
			Per ton.		
Substructure between station 0+00 and 25+00 and mean lower low water to natural bottom.	Quarry run, 3 pounds to 1 ton.	209,000	$1.20	.....	$251,000
Substructure between station 25+00 and 70+00 and mean lower low water to natural bottom.	.....do.....	1,483,000	1.20	.....	1,780,000
Settlement of substructure between station 0+00 and 25+00; estimated bodily vertical settlement 6 feet).	.....do.....	111,000	1.20	.....	133,000
Settlement of substructure between station 25+00 and 70+00; estimated bodily vertical settlement 6 feet.	.....do.....	416,700	1.20	.....	500,000
Superstructure between station 0+00 and 25+00, and above mean lower low water.	5 to 20 tons.....	75,000	2.00	.....	150,000
Superstructure, station 25+00 to 70+00 and above mean lower low water.	.....do.....	150,000	2.00	.....	300,000
Concrete cap, station 0+00 to 70+00; cap 20 feet wide and 2 feet thick.	.....	.....	.....	(1)	146,000
Rock handling plant and opening quarries, additional to requirements for west breakwater.	.....	.....	.....	.....	80,000
Total	.....	2,444,700	.....	.....	3,334,000
Engineering expenses and contingencies, 10 per cent.	.....	.....	.....	.....	333,000
Total estimated cost east breakwater, rubble-mound type throughout.	.....	.....	.....	.....	3,667,000

[1] 7,000 linear feet, at $20 per foot.

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West breakwater.

CONCRETE-CAISSON TYPE (RUBBLE MOUND WITH CONCRETE-CAP TYPE STATIONS 0+00 TO 36+00).

(a) Rubble-mound section (Sta. 0+00 to 36+00).

Section and location.	Size of rock.	Tons of rock.	Estimated unit cost of rock in place.	Length and estimated unit cost of concrete cap.	Estimated cost of section or of concrete cap.
			Per ton.		
Substructure between stations 0+00 and 36+00 and mean lower low water to natural bottom.	Quarry run, 3 pounds to 1 ton.	639,000	$1.20	.....	$767,[illegible]
Settlement of substructure between station 0+00 and 36+00; estimated bodily vertical settlement 3 feet.	.....do.....	123,000	1.20	.....	148,[illegible]
Superstructure station 0+00 to 36+00 and above mean lower low water.	5 to 20 tons	105,000	2.00	.....	210,[illegible]
Concrete cap, station 0+00 to 36+00; cap 20 feet wide and 2 feet thick.	.....	.....	.....	[1]	72,[illegible]
Rock handling plant and opening quarries.	.....	.....	.....	.....	175,[illegible]
Total.....	.....	867,000	.....	.....	1,372,[illegible]
Engineering expenses and contingencies, 10 per cent.	.....	.....	.....	.....	137,[illegible]
Total estimated cost of rubble-mound section.	.....	.....	.....	.....	1,509,[illegible]

[1] 3,600 linear feet at $20 per foot.

West breakwater.

(b) CAISSON-TYPE SECTION (Sta. 36+00 to 77+00).

Section and location.	Size of rock.	Tons of rock.	Estimated unit cost of rock in place.	Concrete and lumber quantities and unit cost in jetty.	Estimated cost of section or item.
			Per ton.		
Foundation for caissons: Stations 36+00 to 77+00.	Quarry run, 3 pounds to 1 ton.	70,000	$1.40	.....	$98,[illegible]
Settlement of foundation and riprap, stations 36+00 to 77+00, estimated bodily vertical settlement 6 feet.	.....do.....	122,000	1.40	.....	171,[illegible]
Riprap protection for caisson foundation:					
Sea side—					
Below −30.....	3 pounds to 1 ton.	26,600	1.40	.....	37,[illegible]
Above −30.....	2½ to 6 tons.....	27,000	2.00	.....	54,[illegible]
Harbor side—					
Below −30.....	3 pounds to 1 ton..	18,900	1.40	.....	26,[illegible]
Above −30.....	1 to 2½ tons.....	19,500	1.80	.....	35,[illegible]
Reinforced concrete caissons: 94 required, 43 feet long by 31 feet wide by 28 to 38 feet deep.	.....	.....	.....	[1]	644,[illegible]
Wooden cell floors and decks for caissons...	.....	.....	.....	[2]	23,[illegible]
Filling for caissons:					
Rock filling.....	2 to 12 inches.....	166,700	1.40	.....	233,[illegible]
Concrete filling (top slabs and between caissons) no reinforcement (includes superstructure).	.....	.....	.....	[3]	37,[illegible]
Superstructure:					
Reinforced concrete.....	.....	.....	.....	[4]	62,[illegible]
Rock filling.....	.....	17,800	1.40	.....	25,[illegible]
Total.....	.....	468,500	.....	.....	1,447,[illegible]
Engineering expenses and contingencies, 15 per cent.	.....	.....	.....	.....	217,[illegible]
(b) Caisson-type section, total estimated cost.	.....	.....	.....	.....	1,664,[illegible]
(a) Rubble-mound section, total estimated cost.	.....	.....	.....	.....	1,509,[illegible]
West breakwater complete, using caisson method, total estimated cost.	.....	.....	.....	.....	3,173,[illegible]

[1] 53,700 cubic yards, at $12 per cubic yard, including steel and forms.
[2] 590 M feet, b. m., at $40 per M in place.
[3] 7,400 cubic yards, at $5 per cubic yard.
[4] 5,170 cubic yards, at $12 per cubic yard, including steel and forms.

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East breakwater.

Concrete caisson type (rubble-mound with concrete cap type, station 0 + 00 to 25 + 00).

(*a*) Rubble-mound section (station 0 + 00 to 25 + 00).

Section and location.	Size of rock.	Tons of rock.	Estimated unit cost of rock in place.	Length and estimated unit cost of concrete cap.	Estimated cost of section or of concrete cap.
			Per ton.		
Substructure between station 0+00 and 25+00, and mean lower low water to natural bottom.	Quarry run 3 lbs. to 1 ton.	209,000	$1.20	.....	$251,000
Settlement of substructure between station 0+00 and 25+00 (estimated bodily vertical settlement 6 feet).	.....do.....	111,000	1.20	.....	133,000
Superstructure, station 0+00 to 25+00 and above mean lower low water.	5 to 20 tons.....	75,000	2.00	.....	150,000
Concrete cap, station 0+00 to 25+00, cap 20 feet wide and 2 feet thick.	.....	.....	.....	[1]	50,000
Rock handling plant and opening quarries, additional to requirements for west breakwater.	.....	.....	.....	.....	80,000
Total.....	.....	395,000	.....	.....	664,000
Engineering expenses and contingencies, 10 per cent.	.....	.....	.....	.....	66,000
Rubble-mound section, total estimated cost.	.....	.....	.....	.....	730,000

[1] 2,500 linear feet, at $20 per foot.

East breakwater.

(*b*) Caisson type section (station 25+00 to station 70+00).

Section and location.	Size of rock.	Tons of rock.	Estimated unit cost of rock in place.	Concrete and lumber quantities and unit cost in jetty.	Estimated cost of section or item.
			Per ton.		
Foundation for caissons, station 25+00 to 70+00.	Quarry run, 3 pounds to 1 ton.	73,300	$1.40	.....	$102,700
Settlement of foundation and riprap, station 25+00 to 70+00 (estimated bodily vertical settlement, 6 feet).	.....do.....	133,000	1.40	.....	186,600
Riprap protection, sea side below −30.....	.....do.....	30,000	1.40	.....	42,000
Riprap protection, sea side above −30....	2½ to 6 tons.....	31,450	2.00	.....	62,900
Riprap protection, harbor side below −30..	Quarry run, 3 pounds to 1 ton.	18,900	1.40	.....	26,400
Riprap protection, harbor side above −30..	1 to 2½ tons.....	19,500	1.80	.....	35,000
Reinforced concrete caissons, 102 required, 43 feet long by 31 feet wide, 28 to 38 feet deep.	.....	.....	.....	[1]	685,200
Wooden cell floors and decks for caissons....	.....	.....	.....	[2]	24,800
Filling for caissons:					
Rock filling.....	2 to 12 inches.....	177,000	1.40	.....	247,300
Concrete filling (top slabs and between caissons) no reinforcement (including superstructure).	.....	.....	.....	[3]	40,500
Superstructure:					
Reinforced concrete.....	.....	.....	.....	[4]	67,300
Rock filling.....	2 to 12 inches.....	19,300	1.40	.....	27,000
Total.....	.....	.....	.....	.....	1,547,700
Engineering expenses and contingencies, 15 per cent.	.....	.....	.....	.....	232,300
(*b*) Caisson type section, total estimated cost.	.....	.....	.....	.....	1,780,000
(*a*) Rubble mound section, total estimated cost.	.....	.....	.....	.....	730,000
East breakwater, complete, using caisson method, total estimated cost.	.....	.....	.....	.....	2,510,000

[1] 57,100 cubic yards, at $12 per cubic yard, including steel and forms.
[2] 620 M b. m, at $40 per M in place.
[3] 8,100 cubic yards, at $5 per cubic yard.
[4] 5,610 cubic yards, at $12 per cubic yard, including steel and forms.

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LETTER OF MR. W. J. HOTCHKISS.

SAN FRANCISCO, CAL., *September 5, 1914.*

DEAR SIR: Replying to your inquiry of August 27, asking for a statement showing the arrival and departure of vessels from Crescent City, I herewith inclose list showing the arrival and departure of the *Del Norte* and *Mandalay* for the months of October, November, and December, 1913, and January, February, March, 1914, the six winter months. During the six summer months the arrival and departure of vessels can be assumed to be without any serious interruption, they only having to lay outside occasionally on account of northwest swells.

The data in regard to the winter months is a fair average of the interruptions in the arrivals and departures for all years.

If this data is intended to be conclusive of the availability of the port of Crescent City for use of vessels for commercial purposes, I don't think the data is conclusive. Even if such vessels as the *Del Norte* and *Mandalay* could go in and come out every day of the year without interruption, there would never be any considerable amount of business done through that port. All that vessels of the size of the *Del Norte* and *Mandalay* could do by landing and departing from Crescent City would be to give the inhabitants of that section a kind of communication with the outside world, but on account of their size they are not enabled to carry freight at a price that would enable the products of that country to be put on the market in competition with freight rates of other sections where ships of larger tonnage can enter and depart. Without having any signed statement, I can confidently state that lumber is delivered from Coos Bay by the *Nan Smith* to Bay Point, in San Francisco Bay, and Oakland at a rate costing less than $2.40 per M, and that the *Nan Smith* carries about one and one-half million feet. I can also confidently state on information and belief based upon investigation that the net freight charges of one of the principal lumber companies in Eureka to San Pedro last year was $2.41 per M. To the same port San Pedro, from Crescent City, lumber carried by the *Mandalay* is at a cost of $5 per M and into San Francisco Bay it is $3.50 per M.

The point I want to make is that while vessels might come in and go out of Crescent City Harbor in its present condition regularly, the said vessels are not of sufficient tonnage to carry away the products of the country at a profit and in competition with other sections to whose harbors vessels of large tonnage can find safe entry and departure.

Yours, very truly,

W. J. HOTCHKISS.

Lieut. Col. THOS. H. REES,
Corps of Engineers.

P. S.—The delays outside mean that the vessel has laid outside hitched up to a buoy.

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Statement of arrival and departure of vessels from Crescent City, Cal., for the months of September, October, November, and December, 1913, and January, February, and March, 1914.

S. S. "MANDALAY."

(1) Departure from San Francisco.	(2) Arrival at Crescent City.	(3) Laid outside.	(4) Departure from Crescent City.	(5) Arrival at San Francisco.
1913.				
Sept. 27	Sept. 28	3 days	Oct. 2	Oct. 4.
Oct. 11	Oct. 13	None	Oct. 14	Oct. 16.
Oct. 18	Oct. 20	do	Oct. 21	Oct. 23.
Oct. 29	Oct. 31	do	Nov. 1	Nov. 3.
Nov. 7	Nov. 9	1 day	Nov. 11	Nov. 13.
Nov. 19	Nov. 21	11 days	Dec. 1	Dec. 3.
Dec. 7	Dec. 9	6 days	Dec. 16	Dec. 18.
1914.				
Jan. 4	Jan. 6	18 days	Jan. 25	Jan. 27.
Feb. 14	Feb. 16	None	Feb. 17	Feb. 20.
Feb. 28	Mar. 2	2 days	Mar. 5	Mar. 7.
Mar. 12	Mar. 14	1 day	Mar. 16	Mar. 18.
Mar. 21	Mar. 23	do	Mar. 25	Mar. 27.

S. S. "DEL NORTE."

1913.				
Oct. 1	Oct. 3	None	Oct. 4	Oct. 6.
Oct. 8	Oct. 10	do	Oct. 11	Oct. 13.
Oct. 15	Oct. 17	do	Oct. 18	Oct. 20.
Oct. 22	Oct. 24	do	Oct. 24	Oct. 27.
Nov. 5	Nov. 7	do	Nov. 8	Nov. 10.
Nov. 12	Nov. 14	do	Nov. 15	Nov. 17.
Nov. 22	Nov. 24	8 days	Dec. 4	Dec. 6.
Dec. 10	Dec. 12	4 days	Dec. 17	Dec. 18.
Dec 20	Dec. 22	17 days	Jan. 8, 1914	Jan. 9, 1914.
1914.				
Jan. 15	Jan. 17	12 days	Jan. 30	Jan. 31.
Feb. 4	Feb. 7	None	Feb. 8	Feb. 9.
Feb. 11	Feb. 13	do	Feb. 14	Feb. 16.
Feb. 18	Feb. 20	5 days	Feb. 26	Feb. 28.
Mar. 3	Mar. 5	1 day	Mar. 7	Mar. 9.
Mar. 11	Mar. 13	None	Mar. 14	Mar. 16.
Mar. 19	Mar. 20	do	Mar. 21	Mar. 23.
Mar. 25	Mar. 27	6 days	Apr. 4	Apr. 6.

NOTE.—Data in columns 1 and 5 obtained from Merchants' Exchange, San Francisco. Data in columns 2, 3, and 4 obtained from Hobbs, Wall, & Co., San Francisco.

ADDITIONAL ESTIMATES IN RE CRESCENT CITY HARBOR, CAL.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
First District, San Francisco, Cal., July 14, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Additional estimates in re Crescent City Harbor, Cal.

1. The following estimates are submitted for a rubble mound breakwater from A to C and from B to C, as shown on map of Crescent City Harbor, Cal., as requested by the Board of Engineers for Rivers and Harbors. These estimates are based on a width of 20 feet on top at ordinary high water (plus 6 feet) and side slopes of 1 on 2, which is about the slope the stone will assume when dumped in place, and upon the following method of construction.

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2. Stone will be dumped in place from barges to a level of minus 6 feet below mean lower low water, and from that level up to plus 6 feet stone will be placed with a derrick barge from stone barges alongside. A settlement of 6 feet is allowed for, this being deemed sufficient on account of the rocky nature of the bottom over a portion of the location.

3. Using local stone at a cost of $1.65 per ton when dumped from barges below minus 6 feet and $2 per ton when placed with a derrick barge above minus 6 feet, there will be required in breakwater A to C,

421,240 tons of stone, costing	$722,660
Contingencies, 10 per cent	72,263
Total	794,926

and in breakwater B to C.

404,658 tons of stone, costing	$692,370
Contingencies, 10 per cent	69,237
Total	761,607

4. Using better stone from quarries near Eureka or Trinidad at $1.90 per ton below minus 6 feet and at $2.15 per ton above minus 6 feet, there will be required the same quantities of stone as above at the following costs:

A to C (including contingencies)	$900,548
B to C (including contingencies)	863,533

5. It is not believed that the short length of breakwater now proposed would afford sufficient protection to justify its construction. The storms against which protection is needed are southerly storms, and waves from this direction would enter the harbor between the point C and Whaler Island (a width of 2,400 feet) with but little opposition, and vessels would still be unable to lie in the harbor during such storms. The entrance originally proposed of about 1,500 feet width between Fauntleroy Rock and Whaler Island is deemed somewhat too large for so small a harbor, affording only a limited area for stilling effect upon entering waves. For this reason the outer line springing from Lighthouse Rock is preferred, as it gives a broader protected area for the needed stilling effect. Whatever line is chosen it is believed that the entrance should not be wider than the opening between Fauntleroy Rock and Whaler Island.

6. It is also believed that the breakwater should be connected with the shore and that the barrier should be built from Whaler Island to the shore to prevent the inwash of sand along the beach and its deposit in the more protected waters of the harbor.

7. It is also believed that a rubble mound breakwater with a sea slope of 1 on 2 would be very short lived, and would require maintenance amounting to about 15 per cent of original cost per annum until stable slopes have been secured.

THOS. H. REES,
Lieut. Col., Corps of Engineers.

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SUPPLEMENTAL ESTIMATE IN RE CRESCENT CITY HARBOR, CAL.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
First District, San Francisco, Cal., September 13, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Supplementary estimate for breakwater at Crescent City Harbor, Cal.

1. At a recent meeting of the Board of Engineers for Rivers and Harbors at Los Angeles, Cal., which the writer attended, the above subject was brought up for further discussion, and a better understanding was obtained in regard to the views of and the information desired by said board in this connection.

2. My report of July 14, 1915, pursuant to first indorsement of July 2, 1915, was based upon the assumption that the proposed breakwater would be the final and completed structure for a harbor at this point. From the further discussion mentioned above it is now understood that the work suggested is to be preliminary, with a view to ascertaining the resulting development of commerce and thus deciding whether more extensive improvements would be justified.

3. The proposed breakwater would afford a considerable measure of protection, especially against the westerly and northwesterly winds which prevail during the greater portion of the year and which frequently make loading at the wharf difficult or impossible. During each winter season there are usually several heavy storms, beginning in the southeast and veering to the southwest, and during such storms vessels can not remain in the harbor, but run for the open sea and lie offshore until the storm abates. The proposed breakwater would afford but little protection against such storms, but they occur only two or three times a year on the average.

4. There are occasions when, with apparently calm weather along shore, heavy rollers come in from distant storms on the deep Pacific. These waves have slight altitude, but great wave length and high velocity of translation. When they reach the shoaler waters of the coast they create a strong surge or undertow, which heaves a vessel bodily forth and back, causing mooring lines to part and damage to vessel or wharf. The proposed breakwater would interpose a partial obstacle in the direct path of such waves and would greatly diminish the amplitude of the surge within the harbor.

5. On the whole, it is believed that this breakwater would be of considerable benefit to existing commerce and would encourage and permit future development in the use of larger vessels in greater numbers with much less difficulty and delay in loading.

6. With the tentative purpose now in view of demonstrating the value of the improvement before deciding upon more extensive improvements a somewhat lighter structure is indicated, and the following estimate is based upon a crest width of 20 feet at high-water level (+6 feet) with side slopes of 1 on 2 down to −10 feet and of 1 on 1 thence to the bottom, using quarry run of stone from the adjacent islands, to be dumped from barges up to about −6 feet and then placed from a barge derrick, selecting the heavier stone for the

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outer face and top, all at $1.50 per ton for dumped stone and $1.80 per ton for derrick stone.

For breakwater A to C:	
75,532 tons of rock, at $1.80	$135,958
206,631 tons of rock, at $1.50	309,946
282,163 tons of rock	445,904
Contingencies, etc., 10 per cent (about)	44,596
Total	490,500
For breakwater B to C:	
67,532 tons of rock, at $1.80	121,557
206,631 tons of rock, at $1.50	309,946
274,163 tons of rock	431,503
Contingencies, etc., 10 per cent (about)	43,150
Total	474,653

7. It is believed that the breakwater should spring from the shore in order to prevent the intrusion of wave-borne sands.

THOS. H. REES,
Lieutenant Colonel, Corps of Engineers.

LETTER OF ASHLAND COMMERCIAL CLUB.

ASHLAND, OREG., *March 19, 1914.*

GENTLEMEN: We inclose herewith for your consideration, executed copy of resolution passed by the Ashland Commercial Club relative to the proposed harbor improvement at or in the vicinity of Crescent City, Cal.

Truly, yours,

ASHLAND COMMERCIAL CLUB,
By GEO. W. SEAGER, *Secretary.*

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

RESOLUTIONS OF ASHLAND COMMERCIAL CLUB.

Whereas the Crecent City and vicinity harbor project report of Lieut. Col. Thos. H. Rees is now before the Army Board of Engineers of the War Department of the United States for consideration; and

Whereas we are advised that said Army board desires further information as to the prospective future commercial benefits that a harbor at or near this point will offer,

Now, therefore, the Ashland Commercial Club hereby submits the following considerations:

1. That an ocean outlet for the products of the Rogue River Valley and the country tributary thereto is of vital importance to the future commercial interests thereof.

2. That such outlet should be located at that point on the Pacific Ocean nearest to said Rogue River Valley that a safe and accessible harbor can be provided.

3. That this valley is situated midway between San Francisco and Portland; and that, owing to the mountainous topography of the country between this valley and the two terminal markets above named, the rates for transportation are of necessity very high, and in many cases almost prohibitory.

4. That, in consequence, though the valley has some of the largest copper and gold mines on the Pacific coast, it is unable to profitably ship the products of such mines to smelters; though it has billions of feet of timber that is mature and ready for market, it is impracticable to profitably manufacture and ship such timber. That prices of all commodities imported into the valley are, on

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account of the excessive charges for transportation, so high as to seriously burden the community. That the progress of this great region is thus retarded and the development of its vast resources is practically throttled.

5. That an ocean harbor located at or north of Crescent City could be reached by the construction of a railway or a hard-surface highway approximately 100 miles in length as against the present distance of 350 miles to Portland, and more than 400 to San Francisco; and that adequate transportation facilities for reaching such harbor might reasonably be expected in the near future.

6. That the construction of such harbor and of the railways and highways that would inevitably follow would lift a great burden from this valley and from all of southern Oregon, and would in our opinion result in a wonderful era of development and prosperity: Therefore be it

Resolved, That the Army Board of Engineers of the War Department, before whom the above-mentioned report is now under consideration, be requested and urged to give the same immediate and careful attention; having in view not only the practicability of the project itself but also the resulting benefits to the vast and undeveloped region which would be tributary to an ocean outlet located as above described; and be it further

Resolved, That copies of this resolution be forwarded to the War Department, and to Members of Congress from Oregon and California.

Unanimously passed and adopted this 18th day of March, 1914.

ASHLAND COMMERCIAL CLUB,
(Signed) J. W. McCOY, President.

Attest:
GEO. W. SEAGER, *Secretary*.

LETTER OF ROGUE RIVER FRUIT AND PRODUCE ASSOCIATION.

MEDFORD, OREG., *March 19, 1914*.

DEAR SIRS: It has come to our knowledge that a hearing is to be had looking to the matter of building a breakwater and developing a harbor at Crescent City, Cal., and it seems to us appropriate that we speak a word in behalf of this proposed development.

This association is a stock corporation, organized under the laws of the State of Oregon, with an authorized capital of $50,000 and a paid-in cash capital of about $28,000. The par value of its shares is $10 and its stock is held by some 400 different fruit growers in this valley. Our objects are to furnish all orchard supplies to our members and to market their fruit, which consists almost entirely of apples and pears. The output of this valley during the year 1913 was approximately 1,100 cars of fruit, 90 per cent of which consisted of apples and pears. Of this amount this association shipped approximately 375 cars. Our market is the world. Our fruit has been distributed during the past season in all parts of the United States, in Canada, Australia, England, Germany, South Africa, and some of it in South America. We look forward to great benefits to be derived in the future from the opening of the Panama Canal and our ability to ship from the Pacific coast by water. Our selling agents are contemplating sending a personal representative this year to investigate and open up more thoroughly the South American markets for our fruit. They are also contemplating a similar work in South Africa. We believe the time will come when a considerable portion of our tonnage can be shipped from the Pacific coast seaports with great improvement economically and in the physical handling of the fruit. This city is located about 125 miles from Crescent City. A proposed railroad has already been surveyed from here to that point, and we believe that if a first-class harbor could be developed at Crescent City there would be little doubt of this railroad being built and that the advantages to us would be very great.

There are approximately 60,000 acres of apple and pear trees planted in this valley. Our industry is now only in its infancy, but perhaps 6,000 acres are in bearing. A large acreage, however, is nearing the bearing age and we look for a rapid and large increase in our tonnage in the next three to five years. The apple and pear crops of this valley since 1907 are as follows:

	Cars.		Cars.
1907	279	1911	211
1908	188	1912	856
1909	304	1913	1,052
1910	544		

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Estimates for 1914 by reliable experts place the crop at 1,500 to 2,000 cars, and we confidently expect to have a yearly production of 5,000 cars within five years from now.

We have dwelled entirely in this letter upon the benefits that would accrue to the fruit industry from the development of a deep-sea harbor at Crescent City. There are, of course, a number of other interests that would be similarly benefited, but concerning these we do not feel ourselves qualified to speak with the same assurance, and therefore prefer to limit ourselves to discussion of our own particular, business, and a most hearty recommendation of the development of this harbor upon the ground that it would greatly benefit the fruit industry of the Rogue River Valley, which in our opinion is and always will be the most important business of this district.

Respectfully, yours,

ROGUE RIVER FRUIT & PROD. ASSN.,
By S. V. BECKWITH, *Manager.*

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

LETTER OF SHIPOWNERS' ASSOCIATION OF THE PACIFIC COAST.

SAN FRANCISCO., CAL., *April 6, 1914.*

DEAR SIRS: Inclosed please find copy of resolutions adopted at a special meeting of the board of directors of this association held on Monday, April 6, 1914, at this office.

The resolutions speak for themselves.

This association wishes most earnestly that you use your influence in furtherance of the project recommended and thanks you for your courtesy in this matter.

Yours, very truly,

W. F. SULLIVAN,
Secretary.

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

RESOLUTION OF SHIPOWNERS' ASSOCIATION OF PACIFIC COAST.

Whereas the report of Lieut. Col. Thomas H. Rees, Engineer Corps, United States Army, relating to the proposed harbor at Crescent City, Del Norte County, Cal., is now before the Army Board of Engineers of the War Department of the United States for consideration:

Whereas this Association is informed that the said Army Board desires further information as to the prospective future commercial benefits that a harbor at this point will offer:

Whereas an ocean outlet for the products of the territory most conveniently accessible to the said Crescent City, to wit, a large part of northern California, southern Oregon, and territory adjacent extending as far east and north as Idaho, is of very great importance to such territory and will enhance and accelerate its development, now in large measure retarded by the lack of such outlet:

Whereas in addition to the vast commercial advantages to be derived from the construction of such harbor at the said Crescent City, a harbor of refuge is urgently needed at some point along the coasts of California and Oregon:

Whereas the said Crescent City is about centrally located between Columbia River, Oreg., and San Francisco, Cal., and is the most convenient and suitable point for the establishment of such harbor of refuge.

Now therefore be is resolved and the Shipowners' Association of the Pacific Coast, acting through its board of directors, does hereby resolve that the future prosperity and welfare of northern California, southern Oregon, and Idaho, and the future prosperity and welfare of the citizens, inhabitants and property holders of those portions of our common country depend, in large measure, upon the establishment and construction of a harbor at the said Crescent City, Cal.:

And be it further resolved, That the Army Board of Engineers of the War Department of the United States, before whom the said report is now up for consideration, be requested and urged, and they are hereby respectfully requested and urged to act favorably upon the said report and recommendation of Lieut. Col. Thomas H. Rees:

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Be it further resolved, That copies of this resolution be forwarded to the United States War Department, and to the Members of Congress from California, Oregon, and Idaho.

I hereby certify that the foregoing is a true and correct copy of a resolution adopted unanimously at a meeting of the board of directors of the Shipowners' Association of the Pacific Coast, held Monday, the 6th day of April, 1914, at the offices of the association, 112 Market Street, San Francisco, Cal.

OLIVER J. OLSEN,
President.

Attest:

W. F. SULLIVAN,
Secretary.

LETTER OF DEPARTMENT OF AGRICULTURE.

WASHINGTON, *October 27, 1914.*

SIR: In further reply to a letter of September 18, signed by the assistant and Chief Clerk of your department inclosing a letter of September 15 from the senior member present, Board of Engineers for Rivers and Harbors to the Chief of Engineers, United States Army, concerning the improvement of Crescent City Harbor and vicinity, California:

The National forest timber tributary to Crescent City Harbor is within the Siskiyou National Forest in southwestern Oregon and northwestern California. The important watersheds tributary to the coast on this forest from which timber could be transported to a harbor at Crescent Cly are Rogue River, Illinois River, and Smith River. The attached map [1] of the forest indicates its boundaries and the location of these watersheds.

It is estimated that there are approximately 24,289 M feet board measure of timber on national forest land within the Rogue River watershed, 1,949,845 M feet board measure within the Illinois River watershed, and 2,293,415 M feet board measure within the Smith River watershed, or a total of 4,267,549 M feet board measure of timber on national forest land within these watersheds. The inclosed statement gives the net national forest area in acres, and the quantity of timber in M feet board measure on national forest land on the various streams which comprise these watersheds. From this statement you will observe that these watersheds have a net area of 601,131 acres within the forest. It is estimated that there is a net area of 402,425 acres in timberland, the remainder being brush land. The average stand per acre is 10,604 feet board measure, which is comparatively light for that section of the country.

At the present time the great portion of this timber is inaccessible and is dependent upon railroad construction for its sale and utilization. A railroad constructed from Grants Pass, Oreg., through the Illinois Valley to the coast at Crescent City, or some other suitable point west of the Siskiyou Forest, would permit an outlet for most of it, although it is doubtful whether with these transportation facilities sales could be made for some time, since the timber privately owned within and west of the Siskiyou Forest is of higher quality and more accessible to the coast and would consequently be cut and marketed more profitably than the national forest timber. It is believed, however, that an outlet to the coast will afford the best means of obtaining a market for the national forest timber, since it is largely Douglas fir of medium quality, which could not stand eastern shipment by rail in competition with the higher class of Douglas fir produced farther north. For this reason it is believed that the construction of a railroad through the national forest, with a terminus on the coast at Cresent City or some other point affording harbor facilities, would greatly facilitate timber sales on the Siskiyou Forest, but it hardly seems probable that much tonnage would be furnished to the railroad from the forest for water shipments until the better and more advantageously located private timber has been marketed.

Very respectfully,

C. F. MARVIN,
Acting Secretary.

The Honorable, the SECRETARY OF WAR.

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[1] Not printed.

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Net acreage of national-forest land and estimated quantity of national-forest timber in M feet board measure within the Rogue River, Illinois River, and Smith River watersheds in the Siskiyou Forest, Oreg. and Cal.

ROGUE RIVER WATERSHED.

	Net national forest area.	National forest timber.
	Acres.	*M feet b. m.*
Slate Creek	6,200	24,200
Total	6,200	24,200

ILLINOIS RIVER WATERSHED.

Briggs Creek	26,518	204,570
Rancherie Creek	33,691	124,[illegible]
Gold Basin:		
Eight Dollar Mountain	37,705	185,[illegible]
Josephine Creek:		
Rough and Ready	23,991	3[illegible]
West Fork Illinois River	17,403	115,500
Woods Creek	3,143	2[illegible]
East Fork Illinois River	21,710	155,[illegible]
Page Creek	2,432	2[illegible]
Elder Creek	4,151	4[illegible]
Althouse Creek	12,779	124,[illegible]
Sucker Creek	40,641	7[illegible]
Deer Creek	19,769	15[illegible]
Total	243,933	1,940,[illegible]

SMITH RIVER WATERSHED.

North Fork Smith River	99,543	2[illegible]
Middle Fork Smith River	81,047	2[illegible]
South Fork Smith River	62,197	6[illegible]
Rowdy Creek	8,543	[illegible]
Lower Smith River	26,283	[illegible]
Upper South Fork Smith River	73,380	[illegible]
Total	350,998	2,[illegible]

WATERSHEDS.

Rogue River	6,200	24,200
Illinois River	243,933	1,940,[illegible]
Smith River	350,998	2,[illegible]
Total	601,131	4,[illegible]

[Second indorsement.]

OFFICE CHIEF OF ENGINEERS, *November 1, 1914.*

To the SENIOR MEMBER THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.
WASHINGTON, D. C.

In response to its request in letter of September 15, 1914, for information in connection with proposed harbor at Crescent City, Cal.

By command of the Chief of Engineers:

H. TAYLOR.
Lieut. Col., Corps of Engineers.

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LETTER OF MR. W. J. HOTCHKISS.

SAN FRANCISCO, CAL., *July 23, 1915.*

MY DEAR COLONEL: I had a talk with Lieut. Col. Rees, and he said he had, at the request of the Board of Engineers for Rivers and Harbors, forwarded modified plans for a harbor at Crescent City.

From this I am led to believe that the board is desirous of giving some relief to the people of that section by making an appropriation for harbor purposes, but that they do not feel justified in recommending a large expenditure of money at this time.

I believe the board is sufficiently informed in regard to the conditions and the necessities of the country and people seeking an outlet from Crescent City without me saying anything on that score.

While we would naturally prefer an appropriation that would build a harbor along the lines of the larger estimates, the people will be satisfied with an appropriation that will give them a betterment of their condition.

I would estimate that 80 per cent of the storms that prevent vessels from lying at the wharf come from the north and west, and a jetty that would start from the shore in the vicinity of the lighthouse rocks and extend south for any considerable distance past the end of the wharf would enable the vessels that at present ply there to load at the wharf twice out of three times that under the present conditions they are compelled to pull out. It would also enable vessels with a carrying capacity of 50 per cent more than those at present employed to load at the wharf with as much security as the vessels at present employed.

I trust that your board can see its way clear to recommend in the near future such an appropriation as in their judgment the necessities of the people of that section, and the conditions of governmental policy at this time, will warrant.

Yours, very truly,

W. J. HOTCHKISS.

Col. W. M. BLACK,
Corps of Engineers.

LETTER OF HON. WILLIAM KENT.

HOUSE OF REPRESENTATIVES U. S.,
Washington, D. C., October 18, 1915.

GENTLEMEN: I inclose herewith copy of the hearing held at Crescent City by members of the Rivers and Harbors Committee, which brought out a clear statement of the needs of the region and the resources that will be developed by such an improvement.

It was my desire to have this evidence before you that caused my request that your decision be postponed pending the receipt of this information.

It seems to me that with the improvement of the harbor facilities there will necessarily come an opening of railroad communication with the interior. Indeed, I believe that assurance can be gotten that such will be the case, and thus this work becomes national in its character to an unusual extent, for the high barrier of the coast range offers but few opportunities for such development and, furthermore, makes north and south transportation by land remarkably difficult to obtain.

Yours, truly,

WILLIAM KENT.

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

STATEMENT OF HON. WILLIAM KENT.

CRESCENT CITY, CAL., *August 17, 1915.*

I wish to state to the gentlemen representing this section that the committee want information relating to the resources of the country tributary to this harbor, the value of the harbor, and the situation regarding railroads here. An examination of this coast goes to show the tremendous difficulty of north and south transportation along this broken coast, and just by way of giving a hint I would suggest that this matter be brought out and that it be shown, not only the value, but really the necessity of opening up in through here the navigation

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possibilities of the Pacific Ocean. There are present here people who understand the lumber business, who know of the great mining resources, and people who are familiar with the depths of water and possible development, and we sincerely hope that at this hearing these matters will be brought out concisely and clearly for the benefit of the committee and for the benefit of our Government, which, I am sure, needs some ports along this great expanse of the ocean.

Judge Childs, I presume, naturally should take charge of the presentation of testimony. I take pleasure in introducing Judge Childs.

STATEMENT OF JUDGE JOHN L. CHILDS.

Mr. Chairman and gentlemen of the committee, there are three classes of commerce that would come to this harbor, if we had a harbor, in great quantities. One is the products of the Rogue River Valley in Oregon in the form of fruit; another is the timber of the vast country back of us; and the other is the product of the mines. We have with us gentlemen who are quite familiar with these three lines of industries, and who will speak to you in relation to the probable business in case we had a harbor. One of the principal resources of the country back of us is the vast forests that we have. The Government itself has wonderful forest reserves, upon which the Government is paying absolutely no taxes—no income whatever to speak of to the counties in which these national forests are located—and naturally we want to speak to some extent or tell you something about the vastness of the resources of our country in that respect. I know nothing about timber, only what I get from the records of the different counties in our territory, and what we get from the Government reports. The Forest Reserve people gave us a little information when we were in Washington, which gave us approximately the amount of timber in the forest reserves of this part of the country. You will concede that timber, being a heavy commodity, must follow the lines of least resistance. If you will refer to the maps of this part of the United States you will find that the rivers point toward Crescent City or nearly so. The mouth of the Klamath is some 16 miles to the south of us. It comes from a northeasterly direction, the fountain head being Klamath Lake. It comes from the northeast. The Smith River, to our north, comes nearly from the east; and Rogue River, about 40 miles by water north from here, comes from a southeasterly direction, and the headwaters of all together looks to Crescent City for an outlet, because we have a possible 1,900-foot elevation between here and the valleys beyond. A possible 1,900 feet of elevation requires a tunnel for our proposed railroad, but not a long one. There is no other place north or south of us here where there is a break in the coast mountains, and all of the country I am going to speak of is crying for an outlet for Crescent City, because it is the only place where it can get to tidewater. It is the nearest place where a railroad can get to the ocean.

The Government records in Washington—in the Forestry Department—show that in the Trinity Forest Reserve there are 13,528,000,000 feet of standing merchantable lumber or timber that will produce when worked into lumber 13,528,000,000 feet. The Klamath Forest Reserve has 16,017,532,000 feet. The Fremont Forest Reserve has 6,360,000,000 feet. The Paulina Forest Reserve has 4,910,000,000 feet. The Deschutes Forest Reserve, 4,176,000,000 feet. The Umpqua Forest Reserve, 20,360,000,000 feet. The Crater Forest Reserve has 7,627,000,000 feet. The Siskiyou Forest Reserve has 11,600,000,000 feet. I will hand a tabulated statement I have to the stenographer.

The statement is as follows:

Forests.	Aggregate, thousand board feet.	Mature, thousand board feet.
Trinity	13,528,000	5,560,000
Klamath	16,017,532	6,310,520
Fremont	6,360,000	2,000,000
Paulina	4,910,000	900,000
Deschutes	4,176,000	2,200,000
Umpqua	20,360,000	7,040,000
Crater	7,627,000	1,210,000
Siskiyou	11,600,000	6,000,000
Total	84,478,532	31,220,520

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Now, all of this timber would not naturally come to Crescent City, but if you will examine the forestry maps, or any other map, of this country you will find that nearly all of this timber is seeking tidewater at Crescent City. You will find that from the contour of the country—from the way the waters run. That makes a total of something over 84,000,000,000 feet, and there are over 3,000,000,000 feet in Modoc County, making a total of over 87,000,000,000 feet that is crying for a harbor which belongs to the Government. The Government will never be able to sell that timber to people who will ship it over the present railroad facilities. The railroads can not take that timber to tidewater, north or south from it, at an expense that will justify the producer in shipping lumber that way. It will not stand for the transportation. The lumber will have to go to tidewater the nearest possible way through the lines of least resistance.

The Government, originally, when our States—Oregon and Washington—were admitted to the Union, positively told us that this land would be kept by the Government until it could give it away to homesteaders or sell it for $2.50 per acre; that, ultimately, when the country filled up, that the people would be allowed to own the timber and the country would derive taxes. It seems to be the wisdom of our Congress and the men at the head of the affairs of the Government to take that timber away from us and say: "We are going to preserve this for future generations. We will sell you the timber, but not the land." Eight million acres are in the Government reserves. We get nothing in the shape of taxes from the Government lands. The money is divided up among all the forest reserves—the money that is received from the sale of timber. Two-thirds of our county is in forest reserves, and 55 per cent of Josephine County is in the forest reserves. Over there they have 15 or 20 per cent that is owned by the railroad company, and two-thirds is not paying taxes. I hope to-morrow, when you are going over that road, that you will see some of the resources. The wealth of that country is great in mineral matters. It is a rough, rugged country, and you will find the roads not to be good, and one reason for that is that nearly all the roads are through the forest reserves of the Government.

We are assessed in this county for a little over $4,000,000. That timber belonging to the Government is selling from $1 to $3.75 per thousand feet in the forest as it is standing there to-day. At $1 it is worth $87,000,000, but they can not sell it until we get an outlet here. A small per cent of the timber is worth $3 a thousand feet, some of it is worth $2, and most of it worth only $1. If that land was sold and paid taxes it would bring into this county something like $800,000 a year. It would bring that if the Government was paying the same rate of taxes that we are paying, and that would build our harbor. Outside of that there is probably more lumber owned by private concerns than by the Government. A low estimate would be 200,000,000,000 feet of lumber that is owned by private parties. We have that much at least. That means several billion dollars to the people of this county and country if it could be shipped. It will be worth several billion dollars to the people of this country when it is shipped.

Now, the ripe timber in all these forest reserves is a menace to the balance of the timber. We are paying hundreds of thousands of dollars a year to protect our forests against fires, and as it is there is something like 5 per cent burning annually—something like $2,000,000 annually of forest reserves that is being burned up, and all of the ripe timber will be rotted soon if it is not taken away.

We know that we have an entrance to this harbor of 1,500 feet and we know that we have deep water inside. We have solid foundations for a breakwater—solid rock, and the only question of its standing there will be the question of building it substantially.

I will now present to you Mr. Blanchard, of Grants Pass, Oreg., a gentleman who knows the needs of Rogue River Valley.

STATEMENT OF MR. O. S. BLANCHARD, OF GRANTS PASS, OREG.

Mr. BLANCHARD. Mr. Chairman and gentlemen of the committee, I happened to be one of those selected by the interests of southern Oregon to present the interests of that section to the Board of Engineers for Rivers and Harbors last spring. The harbor at Crescent City would furnish an outlet for the greater part of southern Oregon, and when I speak of Oregon we must remember that Oregon, in area, is a great State, not only in area, but in standing timber especially. Some of the counties in southern Oregon are as large as some of the eastern States. I would like to ask you to read the booklet I have handed to your secretary, entitled "Thirteen Reasons Why There Should be a Harbor at Crescent City," in which there are printed some of the reasons why we should have

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this harbor. You will see it stated that Harney County is as large as the State of Maryland; Malheur County is as large as Vermont; Lake County as large as Massachusetts; Cook County is as large as New Jersey; Klamath County as Connecticut; Josephine, Jackson, and Curry counties are as large as Connecticut, and Douglas County is as large as Delaware.

We who live over in that country pay the highest freight rates paid in the United States. We have the greatest resources in the United States undeveloped. The Rogue River Valley itself is 300 miles from tidewater at Portland, and 400 miles from San Francisco. We must raise the very finest things in the world or we could not live. We pay 84 cents a box to get fruit to New York City and still make a profit on it. The boxes hold about a bushel.

Covering some of the points overlooked by Judge Childs, I want to say to you that we all believe in conservation. We believe in saving what we have, but we believe that conservation means the intelligent use. Now, our great national forests over there are wonderful things. It is a great thing to keep these forests from falling into the hands of speculators, and it is wonderful to conserve them for the people. But we must remember that timber matures and decays, and when it decays it becomes a fire menace, not only to that which is Government-owned, but that which is privately owned. We have billions of feet maturing every year. We can not cut it because there is not any transportation. We can not haul it to San Francisco at $3.50 a thousand feet, or to Portland at $3.25 a thousand. As a consequence we cut some timber which is used locally for boxes and some is shipped out of the country, but very little. What we cut is the very best sugar pine. And, by the way, the only large tracts of sugar pine in the world are tributary to this harbor. The difference between that timber remaining there forever, and the successful marketing of that timber, is the harbor at Crescent City. We have known that for years. Most of us are eastern people who have come out to the western country and recognize the great natural resources of the country. I came from Iowa. I lived there until 10 years ago. We come out into this western country and see these conditions, and we want to tell about them, and as a consequence we feel that if we had a harbor here at Crescent City that the timber which the Government is holding for its people will be intelligently administered, and the right timber will be marketed, and as a consequence the people will have this timber to use.

Now, we have felt that there is only one thing for us to do—that we must first show our faith in any proposition, and in pursuance of that policy we have bonded the city of Grants Pass, which has 2,000 inhabitants, for $200,000, by three elections. That $200,000 has been expended in the construction of a railroad 10 miles toward this harbor. The survey has been made clear through on the theory that if we constructed this, and get others interested, we would show our faith in this harbor. Twohy Bros. have taken the matter up, and this construction company has agreed to build that railroad as far as Waldo, 40 miles from Grants Pass. Now, out of Crescent City there is a railroad, built as part of that system, not especially with this in view, 15 miles long, which leaves only a small gap between Waldo, Oreg., and the terminus of this railroad here. Now, as I understand, this county is authorized, under the last act of the legislature of California, to bond itself, as I believe, to 5 per cent of the assessed valuation. I understand that assessed valuation runs over $5,000,000, so that 5 per cent would run over $250,000. Six million dollars, I understand, is the approximate valuation of the property in this county. So that we feel, inasmuch as we have bonded our little city over there, and we have a railroad that is being constructed beyond the point where the city left off over in the Illinois Valley (and more richer than the Rogue River Valley), and with, of course, this railroad to Crescent City, we can bring lumber from interior points to this port for at least $2 a thousand, which would be a saving of $5.50 per thousand, which would mean a wealth almost beyond imagination. That railroad would serve possibly 80 per cent, because with the railroad from Grants Pass there is another railroad from Medford 30 miles from Grants Pass that goes up in the Crater Lake, which would reach out and bring in the largest portion of the timber.

Twohy Bros. will own and operate that railroad when it is finished, so far as I know now. They are completing the 40 miles with some agreement with the city whereby when they have completed the 40 miles they will get what the city has put into the railroad. If this committee will recommend the building of the harbor there are men here who will guarantee that the railroad will be constructed to the city as far as money can build it.

In the Rogue River Valley most of our agricultural land is devoted to fruit, stock raising, and dairying. In the fruit industry alone we have more than

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$20,000,000 invested. There will be over 60,000 bearing fruit trees. They will produce over 18,000,000 boxes of fruit a year. We are paying 84 cents to get that fruit to New York City. The bulk of it is sold in New York City and eastern points. Some of it is sold in Europe. We could make a saving on that fruit of more than 40 cents a box, and even if our estimate of 18,000,000 boxes was cut in half, or one-quarter, the saving itself, I think, would be more than the aggregate cost of this harbor.

Judge CHILDS. I will ask Mr. H. M. Parks, director of the Oregon Bureau of Mines and Geology to address you. Mr. Parks has kindly consented to tell you something about the prospects of the mines of this territory and part of the country that is demanding an outlet at Crescent City.

STATEMENT OF MR. H. M. PARKS, DIRECTOR OF THE OREGON BUREAU OF MINES AND GEOLOGY.

Mr. PARKS. In my connection with the work of this bureau in the past three or four years, it has been my lot to look into the mineral resources of the State of Oregon in some detail, and we find, after making a survey of the State, that there are certain areas which promise very much greater as mineral producers than others. You are not interested in the State as a whole to-night, but I want to say that one of the important areas which our work has shown is what we will call the southern Oregon section. The most important mineral belt is included in Jackson, Josephine, Coos, Curry, and Douglass Counties, but the most important section in the larger section I have outlined is the Rogue River Valley and the Illinois River Valley. In this valley we find that the rocks are peculiarly basic; much more basic than is found in other sections of the State. That means that the minerals which are characteristic copper and iron are found in great quantity. They are, however, minerals which are not amenable to treatment under conditions other than the very best conditions; that is, mother nature has in some way or other placed in this section an immense quantity of low-grade ores. Speaking of copper, low grades would include less than 5 per cent copper. Ore is a commercial term entirely. It is not a mineral or geological term.

We might define it something like this: An ore is an aggregate of minerals found in quantity which contains a sufficient amount of valuable metals to furnish a reasonable profit over the cost of putting these metals on the market. If you will accept that definition for a moment I would like to discuss with you what effect transportation might have upon this great body of low-grade ores. The spot which I marked there with a cross, marked "Waldo," we might take for the center of this great area. It is pretty close to the center and happens to be on the road, or close to the railroad which is coming out at Crescent City. At the present time ores are being mined in the Waldo country, and the miners have two options: They can ship their ores from Waldo by the Southern Pacific up to Tacoma or they can ship by the Southern Pacific again and down to a smelter in northern California. The railway charge on the ore produced at Waldo is $4.80 from the end of the railroad, which we will call Wilderville, to Kennett, plus $7 wagon haul from Waldo to Wilderville. That comes pretty close to $12 a ton. Now, let us consider just two other factors of cost in getting value out of that ore. The other two are mining and smelting. These are standard in any case. I will simply say that the smelting charges would be $5 to $6 on such ore, and the mining would probably be in the neighborhood of $2, so that, adding these together, we have $7 for the mining and smelting charges against $12 in transportation charges from this section which has an immense quantity of copper ores.

Now, if we had transportation to Waldo, which we have been promised in a very few months, and again if that transportation instead of being by way of the Southern Pacific goes out to a smelter maybe at Crescent City, or we can bring the ore to the Pacific Ocean and then send it by water to the smelter at San Francisco at a very small cost, we would then estimate the cost of mining and transportation and smelting, the mining and smelting being at the same cost as I said before, but in these new conditions of transportation we would estimate that the charges from Waldo to Crescent City would not be over $1 per ton, and then, used as a ballast in our steamships, would cost something like between $10 and $11 a ton to get the value. That is assuming that the lower end of that road is constructed. Until it is constructed the only outlet is going by Grants Pass. The charges over the completed portion would be about $1 a ton. Motor trucks are now hauling the ore at $7 a ton. It is being hauled out both by motor truck and wagons. They are loading something like a car a day.

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I want to call your attention to the fact that transportation is going to make about 25 to 50 times as much ore available in the Waldo section as is available under present conditions. Remember my definition of ore. It happens that mother nature, as I said before, has placed there a large amount of low-grade copper ore—that is, under 5 per cent. Five per cent ore can not be handled at present at Waldo. Nothing is being handled much lower than 10 per cent ore at the present time, although probably about 7 or 8 per cent might be their limit under present conditions.

The point I want to impress upon you is the fact that when we do get the transportation that I mention it will make 8 per cent copper available at Waldo. It will make iron ores and chrome ores available, and we will have many millions of tons then that are not available now. At the present time it costs $19 to transport and treat ore, and 5 per cent ore has a gross value of about $20 a ton to-day. A year ago it was not worth that much. I would estimate that there is between 4,000,000 and 5,000,000 tons that can be handled under present conditions, and with this harbor completed I would say there is 15 to 20 times as much ore available. We know nothing of the oil resources of the country. I want to say that besides copper we have also a large quantity of low-grade gold ores which would be available along this route in this great Rogue River and Illinois River Valleys. We would have the iron ores and the chrome ores. Certain of the gold ores would be handled at home and some would have to be shipped. The larger values of the ores I mention in the Waldo district are copper. I do not know why God put so many low-grade ores in this section unless it was to force us to put in transportation through the harbor at Crescent City.

STATEMENT OF MR. O. S. BLANCHARD.

Mr. GALLAGHER. Would you ship the products of the farm and orchard through the canal?

Mr. BLANCHARD. Nothing, instead of possibly our beef, and also pears and apples. I think it is recognized that we raise the finest pears in the world. These pears are sold in the New York market and in the English market. Other than these there would be very likely very little fruit shipped. Possibly two years from now there will be close to 18,000,000 boxes of fruit shipped out of the Rogue River Valley. The biggest part of it would go east. Fifty to 75 per cent, I think, would go through the Panama Canal. Some of the rest would be sold in this section; some would go to China. Some of it goes by fast express cars to the East. We pay 84 cents a box to carry it east; then there is the cost of picking, packing, cultivating, and raising your trees to maturity. This is a tremendous expense, and if we did not raise the finest fruits in the world we could not sell them. The temperature gets down sometimes as low as 28 or 29, but is usually 74 to 76 in the wintertime. We have no excessive heat in the summer. I have seen it 102 and 103 in the summer time, but not much heat at a time. With transportation to this harbor here at Crescent City we have not only the eastern markets opened up to us, but we have all the markets of the Pacific Ocean opened up to us. The first harbor on the north is 180 miles away. This harbor could be used as a harbor of refuge if it was completed. We are 25 miles closer to the Orient than any other harbor on the Pacific coast.

STATEMENT OF HON. HARRY LANE, UNITED STATES SENATOR.

Mr. Chairman and gentlemen of the committee, I first visited the Rogue River Valley in 1860. My father was through there in 1849. Its general conditions are familiar to me. It is a beautiful little valley; it is rich and has an ideal climate, but is unfortunate in not having an outlet. Railroads going in from the north find these ranges of mountains, and they use two or three of the largest-size engines on their passenger trains, and so it has been peculiarly unfortunate. It is so isolated that the people who live in it were unable to do well and were restricted. The resources of the country were bottled up. A carload of plumbing supplies or furniture costs as much to ship from Portland, Oreg., to Grants Pass as it does to ship it from Chicago to Portland. We used to freight in there with pack trains; later with wagons; and then the railroad comes in. It so happens that there is a low pass through this country—a low grade. The road that you will go over is a toll road, built by an old gentleman in 1849, and the route was so carried as to bring all the traffic by the stations that he owned and avoid other stores. He sold them his hay and meals and

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deflected the road here and there. There was a good route through, which he carefully evaded, and the traffic has always been the way he established it. There is a low pass coming in and going out. They have unlimited resources. There is no limit to the amount of fruit they can raise. There is no question but there is a good market for their fruits. The people of the country need them, and they have got to sell them. They are entitled to an outlet if there is any way that one can be accomplished. In all reason and justice they are entitled to it. It opens up an enormous territory of timber. The territory extends on up to the summit of the Cascades and through the Butte forests there, the like of which do not exist anywhere else in the world.

This port here is a halfway station between the Columbia River and San Francisco, and it is off a stormy coast. We have a different ocean from the Atlantic. The breakers roll higher, there is a greater ground swell, and there are greater rollers. Over 200 people were drowned on those jagged rocks there some time ago. With an extension of a sea wall (the harbor is protected from the south by a cape and a great bend) and with protection from the winds coming from the other direction it will make a good harbor. The water inside is deep. It will require, in my opinion, very little dredging. Now, upon the very beaches themselves the sands of the shore are about 50 per cent iron ore. It makes the finest steel in the world. I am told there are hundreds of thousands of tons of it there. It also carries gold and platinum. The interests that this harbor will serve, why they are beyond any estimate that we can make for you. This is a stable proposition. There is nothing problematical about it. The resources are real. the thing is real, the gateway is accessible and will be opened, and they are entitled to a good outlet. I have not mined in the valley, nor have I farmed there, yet I had an old aunt who went there in 1853. She died last summer. In the early days they took out fifty millions of dollars in gold dust and nuggets, besides what was carried out in the coats of the miners. They are taking out gold now, and you will be accompanied by the owner, and see his mine to-morrow. He takes out thousands of dollars. There is much rich ground in the Rogue River Valley that has never been mined because you can not get water to it. There is low-grade ore—free milling ore of high grade—there which would go to market if they had a railroad.

STATEMENT OF MR. J. F. READY, MAIN BUILDER OF THE RAILROAD.

The assessed valuation of this county is $5,000,000. It is worth about $400,000,000. You could not buy the county to-morrow for $400,000,000. It is assessed at $5,000,000 because they could not use any more money. It is assessed at that figure because that figure produces the $75,000 or $80,000 which is necessary to run the county. There are tracts of timber here that you could not purchase for $10,000,000. It is impossible to raise anything in the Rogue River Valley and ship it out of the country. You could not ship grain to Portland or San Francisco. If you did you could not compete with a man in the Sacramento or Willamette Valley for the reason that the freight rates are so great that you could not ship grains of any kind and compete with the fellow who is closer to tidewater. The freight on rails from Portland to Grants Pass is $11.80. If those rails are shipped on to San Francisco the rate is $4. The rate on rails from San Francisco to Grants Pass is $14.80; if shipped to Portland it is $4. Now that thing applies to most everything that is shipped into and out of the valley—that ratio. Water competition would cheapen that. Say you had a million tons of ore at Grants Pass and you had your choice of shipping it to tidewater over the three routes. Crescent City is 91 miles away over a 1,900-foot elevation. If you selected San Francisco you would have to take it over a 1,425-foot elevation and 470 miles away. If you ship it north to Portland it is 300 miles away and the climb over the mountains north from Grant Pass is something over 2,500 feet.

We brought a suit against the railroad company to compel the railroad to reduce the rates on 25 commodities, and we got a reduction on 12 of 15 to 60 per cent, but it took us three or four years to get it. There are 70,000 people in the Rogue River Valley depending upon this harbor. There are 50,000 acres of fruit trees there. They are the finest equipped orchards in the world. The success of all that section is dependent upon this harbor. Without this harbor I do not believe that those people will ever get a railroad here. I live at Grants Pass. I am interested in that valley. All the people of the valley are interested in this harbor, for the reason that the valley is tied up. It is being checked up commercially by the railroads. I am not an antirailroad man. There is no other stretch of country of 900 miles, from Portland to San Francisco, that only

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has one railroad. For that reason we are handicapped, especially so that you can not raise anything there except the highest-grade stuff. About 90 per cent of the fruits raised in the valley to Europe. They will not go this year on account of the war, but in normal times most of that fruit went to Europe. They can not sell it on the Pacific coast. The highest point on the new road would be 1,920 feet above sea level. Grants Pass is 938 feet. Only one-third of this county is assessed. One-half of Jackson and Josephine Counties are owned by the Government. There is a peculiar condition about the ores over there. You do not have to have large sums of money to open up those mines if they had railroads, like other copper mines in the world. You can make them pay without any capital. This ore is not imaginary ore. Five miles of underground work has been done over there. There are about 50,000,000 tons there, and the proportion that can go under present conditions is very small. The Waldo ores would come to Crescent City for $1 a ton. It would eliminate a $7 wagon haul and 380-mile railroad haul. Tidewater at any place in the world is a market for copper. I have spent 10 years and $40,000 or $50,000 on experts in this county. We have forests, copper, gold, platinum, etc., and I would like to tell you more about it, but I do not know much about the country, although I have spent all that time and money on it. There is no other place where you could spend a million or five million dollars on a harbor that will produce more tons of commerce than you can right here.

STATEMENT OF MR. W. J. HOTCHKISS, OF SAN FRANCISCO.

Mr. Chairman and gentlemen of the committee, it is just about the same distance from Ashland, at the south end of the Rogue River aVlley, to Grants Pass as it is from Petaluma to Asti, in Sonoma County, through which you traveled a few days ago. You found in Sonoma County some fertile land, maybe 15 miles wide. Comparing this 10 or 15 miles of good land in this great county of Sonoma with the Rogue River Valley, and there is more good land in this area four times over than there is in all these great countries we saw down there, which is the most prosperous part of California. Talking about Rogue River Valley; here is one little item in Mr. Blanchard's book. I would like to have these facts sink into your mind. I would like to have you understand thoroughly what it means to say that there are 60,000 acres all planted—not going to be—but going to come into bearing in one and a half years and produce 52,000,000 boxes of fruit, which if it could be shipped through this harbor, would save annually in freight, between the facilities of transportation offered by this harbor and any other that is available, $7,146,000 for each year. Now, we are just talking about a few apples and pears that they raise over there. One of you gentlemen asked how much of these mines have been developed. It is a wonder that any of that ore has been taken out. It is a wonder that the people have ever gone to work and developed the country the way they have. They did not know what they were doing, but now they find out what they have done and they want to get their goods out of that country. I happened to be up in Alaska a year ago and I know why the United States Government is starting in to spend $50,000,000, and when they get that spent I know how many more million dollars it is going to take to get in there; and I have the word of one of the great experts that there is more copper between Crescent City and the Rogue River Valley than the railroad will ever bring out of Alaska. In some places we are talking about chickens and hogs and pigs and alfalfa. We have timber out here. You take any of these items that this country produces and is wasting and they will warrant the expenditure of this money on the harbor.

STATEMENT OF CRESCENT CITY HARBOR DELEGATION.

APRIL 7, 1914.

GENTLEMEN: The undersigned, a delegation representing the city of Crescent City, the county of Del Norte, in California, the city of Grants Pass, the county of Josephine, the city of Medford, the county of Jackson, in Oregon, and the commercial clubs of the respective communities represented by the above-named places, as also and including varied and diversified business and commercial interests thereof, respectfully submit to you and for your consideration the following statement, arguments, and appeal to your honorable board, concerning the certain Crescent City Harbor project report and recommendation of the

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Hon. Lieut. Col. Thomas H. Rees, district engineer of the Army Board of Engineers, and beg leave to be heard orally and present data and file exhibits at the time and place of hearing of the above-mentioned matter, to wit: On April 7, 1914, at Washington, D. C., and before your honorable board, and in addition hereto respectfully request that the statements, arguments, and appeal of all those who desire to be heard in support of the statements and proof herein referred to which shall be submitted in answer to the reasons of your honorable body heretofore made and noticed in connection with your temporary disapproval of the said report.

The particular reasons referred to are those set forth in subdivisions (*a*) and (*b*) of the annexed copy [1] of your notice to parties interested bearing date February 24, 1914. If, after the hearing upon matters in question pertaining to the Crescent City Harbor project, your honorable board is not yet satisfied that the claims and statements presented by us are meritorious, timely, and an urgent necessity to the prqspective future commercial advantages and interests of this harbor and tributary sections, then we respectfully request that additional time be granted us to present to you other and further information such as we have been unable to assemble and so compile as to properly submit to you.

We feel satisfied, however, that you will be fully convinced that this is an improvement of such national importance to the present and prospective future commercial interests that the proposed expenditure will not only be justified but that it is an urgent present necessity because of the national need of additional harbors on the illy provided Pacific coast, the lack of which prevent the occupancy, settlement, and development and profitable industry of the many and vast localities and stretches of naturally resourceful territory tributary to an ocean outlet at or in the vicinity of Crescent City.

Further, because of the fact that the lack of harbor improvement at this point has held back, since the early settlement of the northern part of California and southern part of Oregon, and will continue to hold back, the development of various diversified resources and industry in such as vast forests of redwood, spruce, fir, cedar, sugar and yellow pine and oak; also extensive mines of iron, copper, gold, silver. lead, coal, platinum, jade, and other minerals; as also the profitable industries in agriculture, dairying, horticulture and vinticulture pursuits; also stock raising.

Wherefore, we respectfully request and urge that said report and recommendation be favorably considered and acted upon, and that we be granted the protection and shipping facilities in harbor improvements that the proposed work when completed will afford us.

Respectfully submitted.

CRESCENT CITY HARBOR DELEGATION,
By G. A. WEBB, *Secretary*.

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

INTRODUCTION.

On May 26 and 27, 1911, a preliminary examination was made by Col. John Biddle of the harbor at Crescent City, and on the evening of May 27 a public hearing was held.

On May 28, 1911, the Crescent City Harbor project question was discussed with the Commercial Club of Grants Pass, Oreg.

On July 8, 1911, Col. John Biddle addressed a letter to the War Department, reciting, among other things, the above facts and further reported: "A well-protected harbor of reasonable size is considered desirable along this part of the coast for commercial purposes if it can be obtained at a justifiable cost and if the communities interested contribute to its construction." Col. Biddle further recommended a detailed and complete survey of Crescent City Harbor, Wooleyport, and vicinity.

Later and during the summer of 1913 the detailed survey was made by Mr. Morton L. Tower under the supervision of the Hon. Lieut. Col. Thomas H. Rees. In January, 1914, the report of Col. Rees was forwarded to the Army Board of Engineers at Washington, D. C., and after having been taken up, considered by them, was temporarily disapproved for reasons by them stated in their formal notice of date February 24, 1914, a copy of which is hereby annexed and marked Exhibit A. Thereafter a date for hearing was set for March 10 at Washington, D. C., but this date was later continued to April 7, 1914.

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[1] Not printed.

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STATEMENT.

First. The question of incurrence of further expenditure for additional navigation facilities, mentioned in subdivision (b) of notice given to parties interested by the Army Board of Engineers, is not pertinent at this time, because an adequate harbor of sufficient capacity and size will be provided for by the improvement.

Second. The proposed planned harbor will take care of 2,000,000 tons annually.

Third. Nowhere between San Francisco on the south and the Puget Sound on the north is there a harbor with an entrance depth of 32 feet or without a bar except at Crescent City.

Fourth. When the tonnage in or out of this harbor exceeds the 2,000,000 amount above mentioned then the additional Government outlay for expansion will be justified because of the commerce and commercial interest which, because of such congestion, will be benefited by such expansion.

Fifth. It is not possible to get a harbor with an entrance depth of 32 feet at a Government expenditure of $1,578,750 at any other point between San Francisco and Puget Sound except at the point now under consideration.

Sixth. The Pacific coast and its abutting tributary sections, between San Francisco on the south and Astoria, Oreg., on the north, is the most richly laden with natural resources of any part of this coast, and is also the most illy provided with harbors of any part of the commercial world.

Seventh. A harbor any place on the Pacific coast, between Astoria, Oreg., and San Francisco, Cal., and particularly between Eureka, Cal., and Coos Bay, Oreg., is of national importance to the United States because: (a) It will be a direct means of developing unoccupied and now nonproductive resourceful Government lands, and is the only outlet by which the Government can ship profitably its approximately 80,000,000,000 feet of reserve timber; (b) because this point with the proposed improvement undertaken and done, will make the most feasible harbor of refuge between Astoria and San Francisco.

Eighth. A large percentage of the unoccupied Government lands will be taken up, homesteaded, cultivated, occupied, and made productive as a direct result of the construction of the proposed harbor improvement at this point.

Ninth. The building of the proposed harbor improvement will reclaim and make valuable and productive enough land to alone justify the Government expenditure asked for.

Tenth. A harbor at Crescent City, Cal., is nearer to the Orient than Portland, Astoria, or San Francisco.

Eleventh. A railroad is now being constructed from Grants Pass., Oreg., to Crescent City, Cal., a distance of 91 miles, 10 miles of which is graded on the Grants Pass or interior end, and 11 miles of which is constructed and in operation locally at the coast or Crescent City Harbor end. The terminals, surveys, and rights of way over the remaining 70 miles is already acquired.

Twelfth. The city of Grants Pass, Oreg., has voted $200,000 of the bonds for additional construction of this railroad, which is known as the California-Oregon Coast Line.

Thirteenth. Railroads built from the interior to Crescent City, or vice versa, require the construction of this harbor to promptly and regularly take care of the freight that would be shipped to and from and through this ocean outlet.

Fourteenth. The present combined tonnage of Del Norte County and that tributary to this ocean outlet is sufficient to justify the expenditure of the proposed work.

Fifteenth. The saving in one year on the fruit crop of the Rogue River Valley in Oregon will more than equal the entire cost of the proposed harbor construction when the orchards already planted are in bearing.

Sixteenth. The direct benefit to the United States in increased value and productiveness to her now unoccupied and nonproductive lands which the construction of this harbor and its immediate resultant, viz, the construction of the railroad and the influx of homesteaders and settlers and the commercial activity which both of these will bring about, is sufficient to justify at this time a Government expenditure of at least $1,600,000.

Seventeenth. There is 60 billion feet of timber that lies in the interior but tributary territory to a harbor at Crescent City, which can not be marketed at a profit. Most of this timber is matured and is wasting and decaying and liable to destruction by fire. True conservation demands an immediate market. The construction of a harbor at Crescent City makes this possible and opens up

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this tract of timber territory to the markets of the world. In addition, the forest reserve of the Government tributary to this harbor contains about 80 billion feet of timber that must come out through this harbor if it reaches a market through the most economical channel.

Eighteenth. The settlement of the now unoccupied and nonproductive Government lands that will follow the construction of the proposed improvement will build roads to the reserves and public lands, will lessen the cost of caring for the public domain, and will be a helping factor in the Government's policy of conservation.

Nineteenth. The saving on freight at the present freight rate on timber tributary to this harbor would build several harbors costing more than the proposed improvement at Crescent City.

Twentieth. That portion of northern California and southern Oregon which would ship their products through this harbor pay the highest freight rates in the United States. This same country has the greatest undeveloped resources of any like portion of the United States.

Twenty-first. Not only do the localities and communities tributary to this harbor indorse this project, but also communities, interests, and commercial bodies as far north as Portland and as far south as Los Angeles. They recommend and urge that this work be done by the United States Government at once.

Twenty-second. The people of Del Norte County, Cal., are ready to contribute $250,000 to be expended by the Government on this harbor and are willing that a recommendation favoring the proposed Government expenditure be made contingent upon such construction.

Twenty-third. This proposed work if done will benefit a larger area of lands, will create a more diversified line of industries, will convert more dormant natural resources into active assets, and will benefit a larger number of people than any other like project of the same cost to the United States that is now before the Government or any part of the Government for consideration.

Twenty-fourth. The city of Crescent City will procure or furnish the Government during the period of construction lands on shore at convenient and accessible points to the proposed work, to be used by the Government for shops, yards, quarters, and equipment, free of charge to the United States.

Twenty-fifth. The city of Crescent City and the county of Del Norte, Cal., will use its best efforts to procure the use of rock quarries from which to obtain rock for this proposed harbor-construction work without excessive royalty and at the least possible minimum charge to be paid by the Government.

Twenty-sixth. This proposed work is a present urgent necessity because these resources and these resourceful sections have been lying commercially dormant for more than 60 years, and will continue so to do until the United States lends a hand in making more productive and consequently more valuable its own as well as its people's lands.

Twenty-seventh. It will make a commercial center at one of the most logical points from every standpoint along the Pacific coast, between Astoria, Oreg., and San Francisco.

Twenty-eighth. It will be a factor in the further building up of commerce and trade along the Pacific coast without detracting from any other present Pacific coast shipping point or port.

Twenty-ninth. It will become a port that will assist and be assisted by the functions of the Panama Canal.

Thirtieth. Vast areas of land now nonproductive, lying idle and undeveloped and unoccupied, will be automatically made productive and habitable by irrigation work necessary and by settlement on the part of the home seeker as soon as the means is provided for marketing the products of their labor and industry.

Thirty-first. The area irrigated and otherwise prepared for cultivation will exceed such as the Government has repeatedly expended from one to three millions to reclaim in different reclamation projects throughout the United States.

Thirty-second. If private interests could control the revenue to be derived from wharves, ships, piers, and landings of a harbor at Crescent City such as now proposed the money could be obtained and the work begun forthwith on this harbor project.

Thirty-third. The economic resultant, plus the profit on increased commercial business and new wealth created, that would be caused by the construction of this harbor will more than pay a reasonable return on the investment on the amount to be expended by the Government.

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Thirty-fourth. We should get favorable action from this board and should get the appropriation recommended by the district engineer because the United States Government needs this additional harbor just as much as does Crescent City or her tributary territory.

Argument No. 1.

In disposing of the objections raised by the Army Board of Engineers for Rivers and Harbors, we will take them up in inverse order for the reason that subdivision (*b*) of the objections offered can be disposed of in a very few words.

In the first place, the further expenditure which the board evidently has in mind that might be necessary to incur for additional navigation facilities, will not become necessary in the near future unless the commerce and navigation in this section should increase in larger proportions and more rapidly than is expected or has been estimated, and if such increase should materialize then the additional expenditure referred to would be amply justified.

The contemplated work, if done, will give an area and depth of water sufficient to take care of the commercial shipping interests for many years. There will be approximately 148 acres of harbor with a depth of from 18 to 32 feet and 91 acres of harbor with a depth of 12 to 18 feet, and this without any dredging whatever. We understand that if it comes to a matter of dredging, that this will not be difficult because of the kind and character of the material to be removed.

Further answering this objection, we append hereto a copy of a letter addressed to Col. Rees, as also his reply thereto, which are marked Exhibits "B" and "C," respectively. Understanding, as we do, that this portion of your objection is a matter which must necessarily be answered by the district engineer, we pass it and go to subdivision (*a*) of your objection.

We will take this up in the order suggested by the wording of the objection. Subdivision (*a*) recites as follows:

"The board does not believe that present and prospective commerce is sufficient to justify the large expenditure recommended by the district officer even with the local cooperation proposed."

We believe that the present commerce would not justify this expenditure, but we claim that the reason why our present commerce is no larger than it is is due to the fact that steamers are unable to ply regularly in and out of this port, due to the lack of adequate harbor facilities. Also if the proposed harbor improvements are made at this point, that it will be a comparatively easy matter to get into rail communication with the interior and thereby tap for a tidewater outlet, not only the vast acreage of present resourceful territory in and about Grants Pass, Medford, Ashland, and Klamath Falls, Oreg., but also the undeveloped and unoccupied lands that lie between these points and Crescent City, much of which land is Government land, either subject to homestead entry or in the reserve.

We are able to say conclusively that Crescent City, as early as 1850, and particularly from 1854 to 1857, was the natural intake for all of the freight that reached Roseburg, Grants Pass, Medford, Ashland, and Klamath Falls, Oreg., and Yreka, Cal. This was, of course, before there was any rail communication through the interior. The freight rates by rail are prohibitive of the export of a large percentage of the products of the interior section of the country tributary to Crescent City. With a harbor at Crescent City the combined rail freight rate to Crescent City and thence by water to San Francisco or Portland would be enough less to justify the marketing of many products of this interior section which are now confined to local consumption.

The country in, about, and tributary to Crescent City has been and is being held back because of the lack of adequate water transportation facilities, and will continue to be held back until such time as a harbor is secured.

Data and facts supporting our contention in these matters is herewith submitted, as follows:

First. References made to the survey of Lieut. Col Thomas H. Rees on Crescent City harbor project.

Second. References made to a letter from Del Norte Commercial Club, dated March 24, 1914, to Col. Rees, as also to his reply thereto, of date March 26, 1914, copies of which are submitted herewith.

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LETTER OF DEL NORTE COUNTY COMMERCIAL CLUB.

SAN FRANCISCO, CAL., *March 24, 1914.*

MY DEAR MR. REES: I will write you with reference to your Crescent City Harbor project report which is now before the Army Board of Engineers at Washington, D. C., for consideration; also I am inclosing herewith a copy of the formal notice given to parties interested, which is self-explanatory.

As we understand the situation, there are two reasons why the board has temporarily disapproved this report. The first objection, or subdivision (a), being one that calls upon us to submit additional statements, arguments, and proof of the present necessity of harbor improvement because of the present and prospective commerce that is to be benefited thereby.

Their second objection, or subdivision (b), we understand to be with reference to further cost that will probably be necessary to incur to provide an inner basin or channel to wharves, which, to their minds, would involve expensive rock excavation. This second objection, we understand, is one that must necessarily be answered by your department. We understand also that the department does not feel justified in detailing you to appear before the Army board at Washington on April 7, the date set for our hearing in this matter, and in this connection, and for the purpose of meeting so far as possible the second objection offered by them, we would like very much, if agreeable to you, that you write a letter covering your views concerning this second objection. It occurs to us that probably this additional expense, if any, will not be required to be made for some time in the future unless commerce should expand in larger proportions than we have any idea at this time that it might or could, and if it does so expand, then of course such expenditure would be justified. It occurs to us also that there would be a considerable acreage of water of sufficient depth to accommodate the shipping interests and their steamers for a long time in the future.

We would like to hear from you as soon as convenient along this line, stating, if possible and agreeable to you, about what your idea would be of how to meet or how you would meet this objection.

Your reply addressed to the undersigned in care of Mr. W. J. Hothkiss, Fire Building, will reach here promptly.

ACTING SECRETARY DEL NORTE COUNTY COMMERCIAL CLUB.

Lieut. Col. THOS. H. REES,
Corps of Engineers.

LETTER OF LIEUT. COL. THOS. H. REES, CORPS OF ENGINEERS.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
San Francisco, Cal., March 26, 1914.

DEAR SIR: In your letter of the 24th instant concerning the action of the Board of Engineers for Rivers and Harbors on the Crescent City Harbor report, you request my opinion in regard to the second reason given by the board for its adverse action, namely:

"(b) If the work now contemplated is carried out, it is probable that further expenditures will have to be incurred for additional navigation facilities, either to provide an inner basin or channels to wharves, probably involving expensive rock excavation."

In my opinion the work now contemplated in the report will provide ample facilities for the commerce of Crescent City and the tributary region for many years. It is of course expected and understood that local interests will build the wharves or piers that are necessary to accommodate this commerce, and will also, if necessary, dredge the slips or berths required for vessels at these piers. If this be done, accommodations for vessels up to 24 feet draft can readily be provided without any further dredging or extension of the harbor by the United States.

The fact that the harbor will be capable of further extension adds greatly to its prospective value. If there were no possibility of future extension and development to meet the possible demands of increasing commerce, the work now contemplated would have less justification. If the question of the further extension of the harbor to meet the increased demands of commerce should ever arise, it should then be determined according to its merits, but the possibility of the necessity of future development should not be used as a basis for the condemnation of the work contemplated.

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Under the plan of improvement now proposed there will be 1 mile of frontage available for harbor purposes and providing space for 15 piers each 100 feet wide, separated by slips 200 feet wide. If these piers average 600 feet in length, they would have a combined capacity of 2,000,000 tons annually. If the tonnage should ever exceed this figure, the further extension of the harbor by dredging a channel and basin toward Elk River would be amply justified and would probably be undertaken by local interests if not by the United States.

Very respectfully,

THOS. H. REES,
Lieut. Colonel, Corps of Engineers.

Mr. G. A. WEBB,
Del Norte County Commercial Club,
Crescent City, Cal.

Argument No. 2.

This project is unanimously indorsed by the following commercial clubs, boards of trustees, boards of supervisors, common councils, and county courts of the sections interested and tributary to Crescent City, who have willingly passed strong resolutions requesting and urging that this proposed harbor improvement be carried out at the earliest practicable time:

Gold Hill Commercial Association, Gold Hill, Oreg.; Medford Common Council, Medford, Oreg.; Yreka City Trustees, Yreka, Cal.; Marysville Promotion Conference, Marysville, Cal.; Jackson County Court, Jackson, Cal.; Medford Commercial Club, Jacksonville, Oreg.; Roseburg Commercial Club, Roseburg, Oreg.; Talent Commercial Club, Talent, Oreg.; Grants Pass Commercial Club, Grants Pass, Oreg.; Portland Chamber of Commerce, Portland, Oreg.; Oakland Chamber of Commerce, Oakland, Cal.; Crescent City Trustees, Crescent City, Cal.; Sacremento Development Association, Sacremento, Cal.; Del Norte County Supervisors, Crescent City, Cal.; Ashland Commercial Club, Ashland, Oreg.; Klamath Falls Chamber of Commerce, Klamath Falls, Oreg.; Klamath Falls Common Council, Klamath Falls, Oreg.; San Francisco Chamber of Commerce, San Francisco, Cal.; Rogue River Fruit Producers Association, Rogue River, Oreg.; Roseburg Common Council, Roseburg, Oreg.; Los Angeles Chamber of Commerce, Los Angeles, Cal.; Medford Common Council, Medford, Oreg.; Montague City Trustees, Montague City, Cal.; Josephine County Court, Grants Pass, Oreg.; Associated Chambers of Commerce of Pacific Coast, San Francisco, Cal.; and others not herein listed.

Argument No. 3.

RATES.

No section of the United States contains such enormous and valuable natural resources. It is 300 miles to water to the north and 400 miles to the south, and this territory pays the highest freight rates in the United States because of distance from terminals. At Grants Pass instead of paying 95 cents on an average, the community would pay 40 cents per 100 pounds freight with a harbor at Crescent City. This amounts to a saving of millions of dollars annually.

Argument No. 4.

FRUIT.

Twenty million dollars invested in the fruit industry of Rogue River Valley; 60,000 acres planted to fruit in Rogue River Valley, which in five years will produce, annually, 30,000 carloads, or 18,000,000 boxes, 52 pounds each.

PRESENT COST TO NEW YORK.

Per car, 600 boxes, for refrigeration and storage	$150
Per car, 600 boxes, for crating	30
Per car, freight (authority S. P.)	320
Total per car, or 84 cents per box	500

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COST VIA CRESCENT CITY AND PANAMA CANAL TO NEW YORK.

Freight, R. R., to Crescent City, per car, or 600 boxes at 6 cents per box, or 13 cents per hundredweight (no refrigerator needed to Crescent City)	$36.00
Estimated at 40 cents per hundredweight from Crescent City to New York, 31,200 pounds	124.80
Refrigerator from Crescent City, estimated on 600 boxes, 44.3 cents per box, to New York	105.00
	265.80
Annual saving to New York, per box	39.7
Total annual saving to New York	7,146,000

But the markets of the world would be open to us with a harbor at Crescent City.

Argument No. 5.

FOREST RESERVES.

Eighty-seven billion feet of standing lumber lies in the forest reserves in the interior. The Government is conserving this; as a consequence it pays no taxes for local government, which assesses private ownership on the basis of 50 cents per thousand feet. Thus, in a few years the Government has saved enough to build the harbor.

According to the Government forestry policy of to-day all this timber is, or is to be, for sale. The ripe timber must be sold. It can not be sold unless a harbor is provided at tidewater. Thus another reason why the Government needs this harbor.

Argument No. 6.

WHAT AN INTERIOR TOWN HAS DONE FOR ITSELF.

Grants Pass, in Oregon, a city of 5,000 people, has voted $200,000 for a railroad to tidewater. It has acquired a cross-section survey; graded 10 miles of roadbed; is now ready to lay ties and steel; has obtained 33 miles of right of way; has arranged to acquire 90 per cent of the balance; owns 28 acres of terminals in Grants Pass. This certainly demonstrates the earnestness of these people to secure a connection with a harbor at Crescent City.

Medford has completed a cross-section survey to this railroad near Grants Pass for the purpose of connecting with this harbor.

A railroad is now completed from Medford eastward, nearly halfway to Klamath Falls.

This good faith of the citizens of the interior counties, together with their necessities, are matters of record which can be verified with little effort.

Only 70 miles of railroad remains to be built, and this will be completed as soon as a harbor is assured.

Argument No. 7.

TIMBER OF THE INTERIOR.

Not less than 120,000,000,000 feet of standing timber lies in the interior country waiting for transportation. Of this, 72,000,000,000 is fir, mostly matured. There is no market; none is being cut. Why? Because transportation to tidewater is prohibitive.

Under present freight rate it costs $7.50 a thousand feet to tidewater. Under these conditions no one is warranted in establishing a mill for the manufacture of fir.

None of it moves. It stands in a country subject to fire risks and matured timber is a menace to other timber, and costly fire protection is necessary.

What would happen with the establishment of a harbor at Crescent City? A freight rate of $2 per thousand feet from interior points would be excessive, but

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even that would save $5.50 per thousand feet and enable the people of the world to use this fir. It would cut out the fire menace. It would be true conservation. To not harvest it now means it will decay and be lost forever.

Again, that saving on 120,000,000,000 feet of fir and pine means a total saving of $660,000,000 to the world.

Argument No. 8.

COPPER.

Vast quantities of copper ore await an opportunity to be shipped to and from tidewater. One mine in this section alone has more than 1,000,000 tons of ore blocked out. All of this must await the harbor at Crescent City.

There are many other large copper mines waiting this development, and it is no exaggerated statement to say that there is more copper waiting shipment than is exposed at Butte, Mont., and Alaska, besides there is an abundance of coal, lime, clay, and other minerals.

Argument No. 9.

AREA BENEFITED IN OREGON ALONE.

[Compared with other States.]

County.	Square miles.	State.	Square miles
Harney	9,933	Maryland	[illegible]
Malhuer	7,920	Vermont	[illegible]
Lake	7,920	Massachusetts	[illegible]
Crook	7,738	New Jersey	[illegible]
Klamath	5,999	Connecticut	[illegible]
Douglas	4,922	Delaware	[illegible]
Jackson, Josephine, Curry	6,091	Connecticut (again)	[illegible]

AREA BENEFITED AND TRIBUTARY TO HARBOR AT CRESCENT CITY.

[Uncultivated but tillable lands in Oregon counties, as compared with cultivated lands in States as reported in United States Census Bulletin.]

County.	Acres.	State.	Acres.
Harney	3,299,514	Maryland	[illegible]
Malhuer	2,633,487	Maine	[illegible]
Cro[illegible]	1,428,218	New Jersey	[illegible]
La[illegible]	1,423,836	Vermont	[illegible]
Do[illegible]as	1,091,699	Utah	[illegible]
Jac[illegible]on	1,500,000		
Jos[illegible]hine	500,000	New Jersey (again)	[illegible]
Cur[illegible]	319,000		
Kl[illegible]th	1,000,000	Utah (again)	[illegible]

Argument No. 10.

RESOURCES—APPROXIMATE TOTALS OF THE TRIBUTARY TERRITORY.

Wheat, pounds	61,500,000	Wool, pounds	3,805,000
Corn, do	3,725,000	Cattle	166,500
Rye, do	2,600,000	Hogs	39,000
Oats, do	13,000,000	Sheep	236,000
Barley, do	20,200,000	Butter, pounds	2,752,000
Potatoes, do	6,850,000	Apples, boxes	750,000
Hay, tons	9,307,500	Peaches, do	100,000
Hops, pounds	373,000	Pears, do	125,500

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HEARING BEFORE THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS IN REFERENCE TO CRESCENT CITY HARBOR AND VICINITY, CAL.

Act of July 25, 1912.

Col. Beach, Col. Newcomer, Col. Taylor, Col. Abbott, Col. Winslow, and Maj. Kutz were present at the beginning of the hearing. Col. Black returned just before the close, and remained until the close of the hearing.

Senators George E. Chamberlain, of Oregon, and Harry Lane, of Oregon; Congressman William Kent, of California; and ex-Senator Jonathan Bourne; Messrs. W. J. Hotchkiss, chairman; G. A. Webb, secretary; W. W. McLaren, Jas. H. Owen, Dr. J. F. Reddy, O. S. Blanchard, John L. Childs, Edwin O. Holter, and others were present in behalf of the above project.

Col. ABBOTT. Col. Black asked me to say that he was very sorry he couldn't be here this morning, but he was called off on official business at the department.

Congressman KENT. This matter being in my district, it is my duty to introduce the subject. I am only going to say a very little myself and then will request that you hear the delegation, and following me, Mr. Hotchkiss, who is the chairman of this delegation, will introduce the other speakers and give the names and addresses, and so on, of the gentlemen who testify. I have been very much interested in this improvement because I believe it is an important national matter. The dearth of harborage on the Pacific coast seems to me to be a very serious problem. We have very few harbors there, and some of those that we do have are subject to the drift that comes with bars and to great difficulties to navigation. After going up through this country I became convinced that in this case we would have a harbor that would be free from the damage that accrues to most of the harbors on the coast at the mouths of rivers, and also that the matter of the greatest importance—that this is a gateway for a large territory. The coast of California is so rough, so much cut up by canyons, the geographical conditions are so bad on account of the rockiness of the formation that a railroad up the coast is a very difficult undertaking, and where the undertaking has been tried it has been rather unsuccessful. The result of this condition is that we must look to ocean outlets for this back country. At this particular point there is a natural outlet, for Oregon as well as California, which is not true of most of the points on the coast farther south. These gentlemen are here to give testimony as to the resources that will be opened up by this improvement. They are here to state what they are willing to do in the way of cooperation to the end of opening up these resources. They are here to take up matters that your board have probably not had very definitely brought to your attention in the past, inasmuch as they pertain to the resources rather than to the engineering features, with which you are familiar and with which we, of course, are not so skilled and have not the same definite knowledge that you have. Gentlemen, I should like to introduce the chairman of the delegation, Mr. Hotchkiss, who in turn will introduce the other gentlemen that wish to testify as to the features that seem to them important that concern this improvement.

Col. ABBOTT. There is one phase of the case that I should be very glad to have brought out to-day, and that is whether all the interests that you are representing are concentrated upon the movement of the Crescent City location, or whether another location in that immediate general vicinity would be equally beneficial to the interests concerned. It is a difficult engineering problem, at the best—any one of these solutions—and the board would like, in deciding on what they would better do, to know whether the interests are specially tied to one location or whether the question really up is the securing of an ocean entrance in this general vicinity, where the engineering conditions may permit the development of the largest aggregate area for the least expense.

Congressman KENT. In that connection I wish to state that when I was in Crescent City last fall I took that up with the people there and told them that it would be impossible to have anything in the way of an improvement if they were not united, and they agreed with me, and I am quite certain they are absolutely willing to leave the question to the wisdom of the engineers, and that was my understanding of it. However, the gentlemen are here that can explain that matter more fully. I should like to have inserted in the hearings a statement by Forester Graves of the assets of the Federal Government's timber in the forest reserves in this vicinity. There is an immense timber area in public hands back of this improvement. The redwood is all in private hands, but Forester Graves has had a very difficult time in trying to dispose of Government timber

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back from the coast, which timber can not be handled on account of the mountain ranges except by way of the ocean and by way of railroads that would naturally follow this improvement, so that in another sense this is an important National undertaking, and in connection with this I will merely make a rough statement. The estimated amount of timber in these forests is 84,000,000,000 feet and matured timber 32,000,000,000 feet, and this statement goes into the details of where this timber is located and the inability up to the present time of the forester to secure purchasers for this matured timber, which ought to be used, of course, as it matures. Gentlemen, I thank you very much, and I wish to introduce Mr. Hotchkiss, the chairman of the delegation.

Mr. W. J. HOTCHKISS. Answering your question in regard to whether the community there was a unit: Mr. Ferguson represents another harbor proposition, known as Wooleyport. At one time there was a question as to which of these places and one or two other was the better place. Col. Rees decided in favor of Crescent City. That didn't of necessity make Mr. Ferguson think that, but Mr. Ferguson will speak for himself.

Mr. FERGUSON. [Mr. Hotchkiss remained standing in front of me and I couldn't see Mr. Ferguson. He talked extremely rapid and consequently a complete record of what he said could not be obtained.] Mr. Aston, who engineered this port some years ago for Mr. Wooley and represents the engineering features in this thing, and, of course, I have nothing to say on that. As far as the capitalists in this matter are concerned, I represent them, and I want to say that if the harbor goes to Crescent City they are absolutely in support of that and they are ready to assist it in every way possible. As far as Mr. Aston's report is concerned, it was not our idea, * * * so I wish to bring that out in that light, and I hope that covers the situation.

Col. ABBOTT. In connection with Wooleyport is that the Wooleyport project that Col. Rees refers to? The map would indicate that Wooleyport itself was farther south.

Mr. FERGUSON. It is two and a half miles north. But it is just at the back door, so to speak. But, as I say, from representing the capitalists * * * of course, it is just at the back door, so that it doesn't interfere with our interests in the least, and so there is no opposition in our minds at all to this. It is only an idea we had in our minds that a harbor could be constructed in that vicinity for less money. I think Mr. Aston's report should be adhered to. We only wanted to cooperate with the board when we understood that this matter had not been favorably received. We are amply protected. That is a matter solely between him and the board.

Col. NEWCOMER. It was indicated at the point in discussion that there would be a local cooperation to a considerable extent; that is, the estimate is $750,000, or something like that, and that local interests would furnish possibly more than one-half of it.

Mr. FERGUSON. Mr. Aston, if he has quoted that, led you astray. The private ownership was to build that, and I went several times to our people with the idea of raising the money. We were going to build it if the Government came in, and the people said we would better wait to see what the Government was going to do. He might have thought that we were going to get Government aid. Now, the matter is just sewn up as to the question of subsidizing to Cresent City, and I don't know what the people in that vicinity would give, and so Mr. Aston evidently thought we were going to put in some money and the Government would assist us. Our people could never get our money out of it, so that that would have to be done away with.

Col. NEWCOMER. This question, also, Mr. Ferguson: If the Government should adopt a project for Crescent City Harbor, the interests that you represent would not proceed to develop another harbor. You would be satisfied with the Government's harbor?

Mr. FERGUSON. Oh, absolutely—precisely. That may come up some later date, if ever. I really don't know what their feelings toward us are, never having gone into it thoroughly.

Mr. HOTCHKISS. Mr. Chairman, we have various phases of this matter to be taken up and handled by different members of the committee. We have Senators—this is a California project primarily, but the interests of Oregon are more served than the interests of California, as a country to be benefited, as most of the products come from Oregon, except a large part of the Government reserve timber on Klamath and Trinity Rivers. As it is more of an Oregon project than a California one, I want to introduce first Senator Chamberlain, of Oregon.

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Senator CHAMBERLAIN. Gentlemen of the board, I didn't expect to have very much to say in the matter, because there were gentlemen here on the ground who were entirely familiar with the whole situation there. Will speak, however, in only a general way, because I don't propose to try to go into detail. I will say, however, that my State is particularly interested in it because I have always been a very great believer in the improvement of our waterways for the purpose of rate regulation by rail. Now, there is one section of my State that is peculiarly afflicted along these lines, particularly the Rogue River Valley, which is one of the finest fruit sections of the country. There is only one railroad service there, the Southern Pacific system, which goes from Portland to San Francisco, and the rates which have been charged between those points are something awful. It has been a constant effort upon the citizens to maintain an equitable system of rates so that the products of that section may be carried at a rate which would enable them to make some profit on their products. Now, this section, the Crescent City section, would be a natural drainage for that particular portion of the State extending east from Medford and Grants Pass as far as Klamath Falls. There is a branch of the road but that doesn't entirely relieve the situation. There are the immense timber resources, as has been mentioned by Mr. Kent, along the coast, within the Federal Reserve and which they have not been able to dispose of because of the lack of an outlet. That would be opened up by the improvement of Crescent City Harbor. I understand that the district engineer has recommended this project favorably but it was not estimated for by the Chief of Engineers in the estimates for the appropriations for this year, on the theory that Crescent City was small, only having about 1,200 inhabitants, but I believe in the doctrine of Mr. Jim Hill. Harriman never went into a country until the resources were fully developed, while Hill's idea was to go into the country and develop the resources. So in this case that may be true. The resources that would be reached by vessels going into Crescent City, the very fact that the harbor was improved, would at once develop those resources and put the governmental property in a position where it too might be disposed of. And aside from that there are large private holdings, which I have been informed are in a state of undevelopment. The same theory is involved here as was involved in the development of Alaska. Private resources can not develop a country unless there is some means of reaching the market and it was that theory which induced Congress in the construction and ownership of a railroad. I believe from the statements which have been made by these gentlemen that it will tend at once to develop the rich resources of that whole section tributary to Crescent City, and I would like very much to have the project acted upon. The engineer has been on the ground and while he would probably confine his recommendations entirely to the engineering problems, he would yet be in a position to know the resources of the section to be benefited by the construction of the harbor, and I leave it to the gentlemen who know the country well to dwell on the immediate and future possibilities of that section.

Mr. HOTCHKISS. Senator Lane, of Oregon.

Senator LANE. The Rogue River Valley, which is one of the most beautiful valleys on the Pacific coast, really one of the most beautiful valleys, I think, of the world, for its size, I think you will agree with me, is practically at this time in ruin. The Southern Pacific goes through it just beyond the Siskiyou Range to reach California to the south, and to secure an outlet to Portland it climbs over and down two or three other ranges, and transportation is very expensive. And the greater part of the produce is entirely unable to reach the outside market. Fruit is the only thing they ship from the country. They can raise anything that will grow. It is a wonderfully productive valley. That has been the condition of Rogue River Valley since forty-nine. And there were better times in the Rogue River Valley in forty-nine, fifty, fifty-one, and fifty-two than there ever has been since. Since the railroads came in, mining of course has gone out. Why, the valley has land in there practically undeveloped. I noticed last year, when I was down through there, that they had thousands of bushels of the finest tomatoes rotting on the ground. In the city of Portland we couldn't get them. They don't ripen good on account of the climatic conditions and they are ripened by a process of artificial sweating there that ruins the taste, and they are not good. And here are these beautiful tomatoes going to ruin for the reason that the freight rates are so high they couldn't be shipped.

Col. ABBOTT. The railroad rates are high on account of the bridges, etc., aren't they?

Senator LANE. No doubt. I have driven teams both ways, and I know it is very hard pulling on the team.

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Col. WINSLOW. Mining has ceased, hasn't it?

Senator LANE. The old placer mines have been worked out. Now they are finding ledges of copper and other minerals, and if they had an outlet on the coast they could ship it, but you can not ship that by team and you can't afford to haul it at the present rates. Now, for instance, take freight on a carload of plumbers' supplies—pipe fittings, tools, etc.—the freight rate from Portland, Oreg., to Medford, 300 miles, was just a little bit more than it cost to have that carload of plumbing supplies shipped from New York to Portland. It can go 3,000 miles at a cheaper freight rate than 300 miles out there. Let these people have an outlet from the Rogue River Valley to a harbor. These gentlemen have selected Crescent City. I suppose, however, if you build your sea wall so that that harbor would be protected, nature, it being crescent shaped, would make a harbor in which you would not have any further difficulty after the sea wall was built, and it would be a good harbor, too. But now when you once have secured a good outlet there you will develop one of the most beautiful countries we have. They raise an enormous tonnage, and in addition to that I am told they will develop an immense tonnage in a few years. That I know nothing about. But I do know there will be millions of feet of lumber to go out. The proposition is a wholesome one. It has nothing in it at all. Right on its merits it will stand the test, if the Government feels inclined to do it. If they could afford to do it themselves they would do it immediately, and the investment would pay them handsomely. The railroad would cross through there. I am heartily in favor of it for the reason that it will open up a country which is practically marooned, and a country with which I have been familiar since I was a mere boy. I look upon the Rogue River Valley—the fact is, I believe I would rather live in the Rogue River Valley than in any place I ever saw in my life. As far as my influence goes it will be to assist these people in securing the harbor.

Senator CHAMBERLAIN. A few of us have to leave. I want to say that we were due on committee work at half past 10, but we were so interested in this project that we thought we would stay as long as we could, but we have to go now. We have a very important committee meeting.

Senator LANE. I wish to say that I have to go, as I am due on the Claims Committee, and we have several important matters to act on to-day.

Congressman KENT. I have a very important meeting in the Public Lands Committee, and I will have to go.

Mr. HOTCHKISS. Representative Hawley.

Mr. HAWLEY. Again I renew the pleasure of addressing you. I want to illustrate what I have in mind by taking a very world famous power that was isolated from water communication and that is Russia. They first endeavored to get to the Baltic Sea, but the port froze up in winter; so they next endeavored to get to the Black Sea, that they might have warm water and a water outlet to the markets of the world; but that was foreclosed against them by the powers of Europe. And then they built clear across the continent of Asia to the warm ports of the Pacific Ocean in order to find an outlet. These people of southern Oregon have been much in the position of Russia. They have been trying for a long period of years to get an outlet for their products. In the seventies the Government of the United States made an attempt to help them and gave a grant of land to the Oregon-California Railroad, amounting to 12,800 acres to the mile of road, valued at $2.50 an acre, which made a bonus of $32,000 per mile of railroad construction, in order to put a railroad from Portland into San Francisco. But as has already been stated, the cost of transportation has been arbitrary, although the traffic on that is not as heavy as was expected. But as far as the boats run, the rates are reasonable; but beyond Harrisburg they rise and the freight rates are higher the farther south you go, and by the time you get into southern Oregon the highest price of freight rates in the world is paid in proportion to distance and haul and as some one said the other day, it is harder to get into Rogue River Valley from any eastern point—Washington, New York, Chicago—than any other point in the United States.

Now, that emphasizes the difficulties they are up against. And it is just that hard to get out. But in spite of this they have made a very remarkable development. Men in the valley and especially people coming in from the outside, attracted by the very pleasant climate, have expended a considerable amount of money there. If I were to tell you the amount that one county has expended for roads I am afraid you would think it was an exaggeration. They have have spent one million and a half dollars. Jackson County is putting

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money into roads in order that they may have the means of assembling their high-priced products—fruits and other products—at the places of shipment. The Rogue River Valley is only a small portion of the country that will be benefited by the development of this waterway, because the effect of it will reach back over 600 miles into the interior, running clear across southern Oregon. The gentlemen here will speak more particularly of the project of the Rogue River Valley. Formerly that country to the east largely was in my district. The Government has a large irrigation project there. It is a subhumid area and they are beginning to grow the hard wheat, and they can not grow that to profit unless they have a market so they can send it to the places of consumption. At present they must send it north 300 miles and then down the Columbia to Portland and then down again opposite this point, making a travel of seven or eight hundred miles, as compared with what would be needed for the haul if this port was open and the railroad came down here; and Hill is already building across north of Klamath Falls, and instead of hauling seven or eight hundred miles they will need to haul only 200 or 250 miles, and the most expensive portion of the haul—that by land—will be shortened. That eastern part of Oregon is very well adapted to dry farming, and in the subhumid area, of which it was said some years ago that no wheat of value was raised, the "Duro" wheat was brought in, and two years ago it was valued at $2,000,000. They can raise it in very profitable quantities, but it can not stand the cost of transportation under present conditions, and they can raise very many other products there of high value. They can raise a sugar beet that runs 2 or 3 per cent higher in sugar content than that raised in Colorado, and there are various other industries over in this 600 miles of distance away from the harbor that will benefit by this useful improvement and will develop a very large amount of commerce in the course of a few years.

Col. ABBOTT. That commerce would have to go by railroad to the harbor?

Congressman HAWLEY. Yes.

Col. ABBOTT. The railroad rates would not be governed by the harbor?

Congressman HAWLEY. It only affords them an outlet.

Col. ABBOTT. The commission would have to govern that, wouldn't it?

Congressman HAWLEY. It would have to govern that.

Col. TAYLOR. Wouldn't that railroad be likely to be developed by the Southern Pacific?

Congressman HAWLEY. It would be the Hill line. What we want in Oregon is a real competitive road that has money and brains.

Col. TAYLOR. How does the Hill line get down there?

Congressman HAWLEY. At present it would come down the Deschutes and across the bend and then across north of Klamath Falls. (One of the gentlemen brought a little map showing the survey of the railroad, and the distance it would traverse and the direction were discussed before the board.) Mayor Reddy said he surveyed 130 on one end and they had surveyed across the lake. It is expected, also, and there have been surveys made, that the Northern Pacific will try to come in from Vale, Oreg., across through central Oregon and connect with the road north of Klamath Falls. They will have a water grade. A water grade and a downhill pull practically for all their products would mean a good deal. It would be a different proposition if that interior country had to carry its product over several hundred feet of elevation, but that is a high plateau, and you come over the edge and it is a downhill pull to the coast, and it is the minimum cost which ought to stand a very low rate of freight.

Col. WINSLOW. I notice the Rogue River empties into what seems to be called the Illinois River, and that is some distance from Crescent City. Is there a possibility of making a harbor there?

SOME ONE IN DELEGATION. No! The Illinois River empties into the Rogue River.

Congressman HAWLEY. I don't think so. It is a river that carries an immense amount of silt. It pounds in there and spreads out over a large area. The river itself is not very deep and it has a very large mouth, and it would cost a very large amount to put jetties in it, and you would have no very great harbor after you have done it. You see, it comes down that way. The Klamath River runs down through there.

Col. WINSLOW. You follow about the same general route of the county roads?

Congressman HAWLEY. * * * and it is the road up which, if I remember correctly, all the interior of that country goes with their products by wagon. I want to say just one thing more. The gentlemen here will tell you about the

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present resources of southern Oregon—their tree planting, the acreage they have and the number of trees, and the number and value of the mines, and the most valuable mines they have. Although there is a good deal of gold in southern Oregon, the most valuable mines they have, in my judgment, will be those which have been the greatest wealth producers in this country—the copper mines. In the Blue Ledge they have about 11,000 feet of tunnels and shafts and it is a mine in a mountain, and the products of the mine will go on a railroad of some 11 miles, adjoining this, but all will be down here and they don't have to hoist the ore and transport it down, but they mine it and send it down the hill. The copper mines are on the backbone of the mountain, and an expert who was with us, shows a very heavy vein of copper. It is a very high grade of copper—percentage of copper to the ton of ore—and this mine that I speak of, the Blue Ledge—has enough gold and silver to pay for the operation, so that the copper content is pure gain to the operator, and altogether, taking into consideration the country back and the country immediately concerned, now asking the development and proposing to back the railroad so that vessels can come in—they will tell you about all this—but taking the country back of it and the country already developed and the water grade and the possibility of a harbor there at comparatively small expense, for deep water, and the ability for dredging with the suction pump, to make additional anchorage as deep as they want to make it, it is a very attractive proposition, from a layman's standpoint, but having had some little experience in getting the money for a proposition before the committee, I think it is a proposition that is worthy of the Government's support.

Mr. HOTCHKISS. There are often changes in Governments that we hear about out there, and we have some evidences at times, not such as we are asking of you to-day, we haven't had any such evidence as that, but we have reference to the change of representation. At present we are represented by Mr. Kent; formerly we were represented by Mr. Raker, who originally introduced this bill. He at that time was a friend of his constituents and now I think he is still a friend of his friends there. I would like to introduce Representative Raker.

Congressman RAKER. Gentlemen, it has been my pleasure to become acquainted with the Crescent City people, and the surrounding country for a number of years, but farther north into Oregon and south to Eureka, inland through the mountains to Trinity and Siskiyou, and also a number of times from this much traveled road that is marked on your maps here, into Grants Pass and from Grants Pass south through California, north on through the Willamette Valley to Oregon and also east from there over to the Klamath Lake country and there on to Lakeview. In fact, I have been quite familiar, for a good many years, with a great part of that territory and on my first visit to Crescent City, seeing the surrounding country, knowing the Government timberland that was there, seeing the kind of soil and what can be produced on that land after the timber has been taken off, with the privately owned timber and the work that has been done farther north in southern Oregon and taking the mining conditions and the products that are raised in southern Oregon and from that on in through the mountain valleys into the Klamath country and in the northern part of the State of California, it is simply marvelous what has been done by the people who are there under all the adverse circumstances. They have been contending for relief from the railroad rates. You take in th northern part of California, which will be a part of this project and will be benefited greatly; we pay more freight from Reno, on the main line up than it costs to transport the freight from New York, Philadelphia, and Baltimore. The development of that country is retarded and now we seen an opportunity to open up this country by virtue of a railroad that will come through from southern Oregon by Grants Pass or farther south on into Crescent City.

It seems to be the waterway on a water gate through that country and it will open up one of the best territories of southern Oregon and northern California that we have to-day. There are hundreds of thousands of ——— in northern California, south of Klamath, that will be taken up and carried on out to Crescent City, and then the great distance between Eureka Harbor on the south and the harbor in Oregon on the north leaves practically no place for the ships, during high winds and heavy water, to enter, which ought to have a refuge and a place to land in and about Crescent City, and the Crescent City Harbor would be of great benefit in that alone, and I hope this board may see fit to adopt this project. In addition to what has been said by the two Senators from Oregon and Representative Hawley, I want to concur in all they say, because I

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have had the opportunity of going through California in many ways. That country there, which is a large empire in there, will be tributary to this road, and Crescent City would be better than any place we have to-day in that vicinity for this harbor. Those people have to bring their products up the Klamath River and the Salmon River and over the mountain on a little railroad and on to the Southern Pacific, and then pay that enormous expense down. And another thing I want to say is that we, in northern California, are just as vitally interested and know the benefit it will be to us and to southern Oregon and also to the people on the coast living directly around the Crescent City Harbor. It would build up that country and develop it as it ought to be developed. I do not know whether these gentlemen have the facts and figures and data, but I feel I ought to state this: Undoubtedly the committee realizes that practically all of the pine timber lands, after the timber is once taken from it, is but of little use for agricultural purposes of any kind. But such is not the case in this valley. That soil, and the climate, produces the finest agricultural crops of everything you can put in the ground. Fruit trees grow right around the stumps. You see the finest grains raised anywhere, and they raise everything that can be raised to build up a dairy country—build up homes and farms—so that in addition to taking off the timber, when it is taken off, and some value is obtained by the Government, we then have and open up as fine an agricultural country as there is on the globe to-day, or in the United States, and I have—having had the pleasure of representing this district once and participating in its survey and resurvey—I feel keenly the value that it will be to those people, and not only to the local but to the whole country as a development of the West. I want to go even further than that. What little assistance I can give I want to extend it to these people because I know, in fact, as it appears to me—I am not an engineer—from the physical facts, I believe, gentlemen, that if you can possibly see your way clear, with a proper and reasonable expenditure, this is a worthy project on the Pacific coast, and I want to thank you for your consideration in this matter.

Col. ABBOTT. There is one question that I would like to ask, and that is: If the Hill road that you are speaking of comes through and runs down to Crescent City, would there be any return freight that would come into Crescent City and go back over the Hill road and perhaps into the interior country beyond?

Congressman RAKER. As it would appear to me, of course, there would be a considerable amount of the fruits and matter of that kind that would want to be sent back quickly that would go that way. The heavy freight, say for 50 or 60 miles, would not be taken up until you go that distance back from the harbor, but the moment you got back over that distance, possibly 50 miles, you would commence to pick up freight. You would pick up lumber, you would pick up all the copper industries, you would pick up the placer conditions—and that country is permitted to use the placer mines, both in California and in Oregon, whereas they are not permitted to use them in other places—as well as the fruit, grains, and other things. And hundreds of thousands of acres of that land are valuable for the fruit which could be taken on east or west as the conditions might determine, and I believe, while I am not stating anything from an examination of the freight rates, I believe, Mr. Chairman, that it would reduce the freight rates both north and south, and it would be competitive in that entire interior, as it appears to me.

Col. ABBOTT. I should judge your idea is that the present extension of the Hill road toward Crescent City is somewhat the idea of picking up this fruit for transportation east across the country rather than to connect with a possible harbor there and ship it through the canal.

Congressman RAKER. They would take the lumber and all those materials on to the ocean and then take the fruit back East. Of course, some would come on to the harbor, and there are carloads upon carloads of fruit in northern California and southern Oregon that are fed to the hogs and go to waste for want of transportation. I say that from personal observation in my district alone, and there are thousands upon thousands of acres of land there to produce apples and pears and prunes and fruit of that kind, and the people ought to have them, and it will give them means of transportation West. We have a large trade there on the island. I guess along the coast the largest steamers would carry that fruit to the ocean, so that it could be shipped to the South Sea Islands and the lumber could be taken back East. I am satisfied the bay would be assured of this trade.

Col. ABBOTT. You think that the Hill line, being east and west lines, would be a real competitor?

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Congressman RAKER. It seems to me that that would be the case, because it would be competing with a line that has to go 300 miles south or 300 miles north, whereas this line would go 100 miles straight to the ocean. You must get a cheaper rate to send that to the ocean. We have demonstrated that by virtue of hauling. When we had got a railroad through our country there, we thought we were going to get a cheaper rate, but we found that by crosshauling on the other side—by hauling it 50 miles farther—that we got a cheaper rate than we did through the straight rate. And when the haul is shorter you will get a cheaper rate, because they must reduce their freight accordingly. I want to thank you gentlemen very much for the courtesy you have extended me.

Mr. HOTCHKISS. I don't want to encroach upon the gentlemen who handle different parts of this presentation, but I would like to answer your question in regard to that freight into the Rogue River Valley. Whatever their freight rate is now, and it will be presented to you in the schedule, the freight can be landed at Medford and at Grants Pass and at Ashland, through this line from Grants Pass to Crescent City, at 50 per cent of what it is costing now. The railroad might reduce its rate. But with a short rail line of 91 miles, from Grants Pass to the sea, 10 miles of which is graded on the Grants Pass end now by their citizens, and 11 miles upon the Crescent City end, already built, and only 70 miles to be completed in there, the freight will be put in there at 50 per cent anyway of what they have to pay now.

Col. ABBOTT. That is one reason then that was entered in your minds—that the improvement of Crescent City—that they have got their roadbed constructed to that city now, and it would be used as a terminus.

Mr. HOTCHKISS. We thought, in our innocence, that it would be favorably reported upon and as a matter of fact would be recommended by your board. We didn't count upon the necessity of presenting these facts, knowing that you would see only this country tributary to the harbor there, which is large in resources, but which is only a small part of the benefit to come from this harbor, and we have started to connect this interior country with this harbor, which we supposed we were going to have. Every country has some able Representatives and some very good friends. Over there, recognizing our inability to present a matter of such importance as this as well as it ought to be presented the citizens have delegated one of their number, who has represented them in the Senate of the United States for years. They made him a special member of this committee. I have the pleasure to introduce Senator Bourne.

Ex-Senator JONATHAN BOURNE. Mr. Chairman and gentlemen, I received a telegram from the county clerk of Jackson County, asking me to be here, and that is the reason of my appearance. While I was in the Senate, on all matters appertaining to river and harbor work, there were two factors that should be taken into consideration—first, feasibility, and, second, desirability. Your good representative, Col. Rees, has passed upon the feasibility and you are satisfied from that. The question is, the desirability. The two points on which you require further elucidation seem to be the present and prospective commerce in reference to the territory to be benefited by the improvement. I am informed, and I think the information is absolutely reliable, that in a territory embraced by our own present site 10 miles north, 6 miles east, and 28 miles south, there are 15,000,000,000 feet of redwood. The question is as to the tonnage available to a harbor. The building of railroads in there are not necessary for the serving of this redwood in that particular area. Let us confine our attention to that and see what it means. To my mind, we would say that redwood weighing 2 pounds to the foot, this represents 30,000,000,000 pounds of commerce available and awaiting the improvement, which would represent 15,000,000 tonnage of freight there ready. Better, to my mind infinitely, than where other wood or materials of that kind are in the warehouse, because you have got there the element of fire risk. There is absolutely no fire risk with redwood. The redwood won't burn. It is an absolute certainty in reference to that tonnage. Then there is a territory that would be served by the harbor improvement, necessary in order to secure the railroad construction from Crescent City to Grants Pass, a distance of 91 miles, in which there is estimated to be 150,000,000,000 feet of timber, of which the United States Government owns some 60,000,000,000 feet. They have, to my knowledge, according to the reports of the Forestry department, some 25,000,000,000 feet in two reserves—the Crater Lake and the Klamath Lake.

Last summer I made the trip through that territory in an automobile. I am informed that the Forestry Department estimated that 60 per cent of that timber is ripe. Under existing conditions it is impossible to handle that by rail-

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road freight, the freight being practically prohibitive. The conviction is, while we have no figures to submit to you in reference to the reduction, that the freight rate would be very materially lowered from the area served by the proposed road—from Grants Pass, with a harbor at Crescent City—over the existing freight rates. It certainly appears to my mind that there must be some truth in this fact, because the proposed road would only be 91 miles of haul on a 2 per cent grade, while the existing Southern Pacific must haul it 300 miles on a 3.3 grade. Now, in addition to the timber interests of this locality, I am informed by the gentlemen handling the fruit business in Rogue River Valley that the pack last year was 720,000 boxes of freight. They estimate that 18,000,000 boxes of freight will eventually be shipped if they have the transportation facilities. That estimate is based upon present production of acreage bearing and brought down to the acreage planted and bearing in a period of five years. They claim that the saving per box of freight would be at least, conservatively, 50 cents a box. If that is true, and I have no reason to disbelieve the correctness of the statement, the result would be that the community would be benefited, at the expiration of five years, to the extent of $9,000,000 per year in freight rates on the fruit of one valley alone.

I know of my own personal knowledge that for the last 30 years there has been a number of mining prospects there. I advanced considerable of my own money in that business, and I know that some very large-tonnage mining properties have been developed. I personally have not made examination of those districts, but I have had my engineers in there and I have talked with some of the best mining engineers in the world. It is my opinion that with cheaper freight rates the result would be the handling of millions of tons of mining tonnage in that country tributary to this area that would be benefited by this improvement with the railroad completed. Now, the question comes to my mind, from a business viewpoint, in this way: Is the United States justified in expending a million and a half dollars? What would be the benefit? The benefits would be, in my opinion, first, the vitalization of $150,000,000 of assets, in which the whole country would be interested and benefited by the 15,000,000,000 feet of redwood timber in the limited area of territory served by this improvement alone, without any railroad. With the railroad completed, the United States would be benefited to the extent of a billion and a half dollars, in the vitalization of 150,000,000,000 feet of timber that would be served with the railroad extension. Rogue River Valley would be benefited to the extent of $9,000,000 per year in the saving of her fruit, as of five years; hence the period of time estimated by Col. Rees that it would take to complete this improvement. Why, gentlemen, as a business proposition I don't think there is any business man in the United States or the head of any of the large corporations that would hesitate a minute to make the investment if it was many times the amount estimated by Col. Rees.

As I understand it, there are some 70,000 people at the present time that live in the area that is supposed to be benefited by the joint improvement of the harbor and of the railroad constructed into Grants Pass. The population of Oregon has been small relative to the other States, for various reasons, mostly due to the policy of Mr. Harriman when he controlled the railroad interests of that State, and what Mr. Congressman Hawley has so graphically described, in reference to the land grant which has bottled up the southern part of the State; and, as I remember, there are some 3,200,000 acres of land still claimed by the railroad. That being every alternate section, practically means a double amount that is stopped from development. The second objection, or query, raised by the board seems to me not the question of commerce, but the probable further expenditure that would be necessary after the improvement. Col. Rees, according to a copy of a letter that I have seen, written to the board of trade in that locality, has replied that under his estimate, or in his opinion, there would be ample harbor facilities under this improvement, completed, for handling 2,000,000 tons per year, which he thinks would be ample facility before any additional improvement would be required for the developments of many years to come. Mr. Hotchkiss now has a mill on the bay at Crescent City which cuts 30,000,000 feet of lumber per year. He says that given this improvement the lumber cut would be increased to 70,000,000 feet per year by the time of the completion of the improvement. Given that as a statement of fact, that means, to my mind, that there would be $700,000 more expended in that locality for labor, supplies, and material. It also means that given the limit of capacity of the harbor improved, according to the facts submitted by Col. Rees, that that harbor involved would have a handling capacity

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of 1,000,000,000 feet of lumber per year. My impression—I don't state this as a fact, because I haven't had time to corroborate the correctness of my memory—my impression is that Portland to-day ships more lumber than any other port in the world, and that Portland ships about 650,000,000 feet a year. If this is true, why, then, you would have a capacity for handling lumber at Crescent City, given under the completion of the contemplated improvement of 60 per cent more than that handled by the largest lumber-shipping port in the world.

I don't think there is any question in reference to the capacity. If that question still remains doubtful in the minds of the board, I would suggest that a clause be inserted that the local community would take care of the inside harbor improvements when they were needed, after the completion of the present project. Undoubtedly, as Col. Rees says in his letter to the board of trade, a copy of which I assume has undoubtedly been submitted to you gentlemen of the board here, that the owners of the mile stretch frontage of harbor in putting in their slips would unquestionably do what dredging for the slips themselves that is necessary. I thank you very much, gentlemen, for your courtesy. I bid you good morning. Are there any questions you would like to ask?

Col. ABBOTT. I ask them as we go along.

Mr. HOTCHKISS. In regard to the ownership: This harbor is owned by the city of Crescent City. It is not a private matter. All the water frontage was given to Crescent City by a special act of the Legislature of California. The harbors of the State of California are either controlled by the State or by the cities. I believe the State now controls San Francisco Harbor, and there is some movement to change that control, but I don't know. What I want to state is that this is a public proposition. There is no private ownership of any of the public utility of water front.

Maj. KUTZ. Is the existing wharf a public wharf?

Mr. HOTCHKISS. No. It is under a franchise.

Maj. KUTZ. Does the city control the wharfage rates?

Mr. HOTCHKISS. They regulate the entire charges now, and what they would be under this new harbor. I want to introduce Citizen Blanchard, of Grants Pass, who represents the interior Oregon country.

Mr. BLANCHARD. Gentlemen of the board, I represent a portion of the Rogue River Valley. You gentlemen no doubt are aware of the great size of the State of Oregon. Oregon is as large as Pennsylvania, New York, and New Jersey combined. To get some idea of the size of the counties which will be benefited in Oregon by this improvement, I have prepared a little schedule from which I will read and which will later be submitted to the board in printed form. Harney County contains 9,933 square miles. It is as large as the State of Maryland. Malheur County contains 7,920 miles. It is as large as the State of Vermont. Lake County contains 7,920 square miles. It is as large as the State of Massachusetts. Crook County contains 7,738 square miles. It is as large as the State of New Jersey. Klamath County contains 5,999 square miles. It is as large as the State of Connecticut. Douglas County contains 4,922 square miles. It is as large as the State of Delaware. Jackson, Josephine, and Curry Counties, 6,000 square miles, all of these three counties together being as large as the State of Connecticut. So that we have counties in Oregon totaling up in square miles about the equivalent of all these States. Now, then, I figure that it might be material and it might be considered by this board to form some estimate as to the number of available acres as compared with the available acres of other States [referred to printed report].

Col. ABBOTT. Do they own the present redwood timber?

Mr. BLANCHARD. No; not the redwood. No. You see, there is very little of this land in Oregon that has any redwood. The redwood is in California. But there is considerable of this area at present covered with timber in Oregon. A considerable portion of it. Those statistics, gentlemen, are derived from the census taken by the United States Government. Now, the Rogue River Valley is a valley 56 miles long and from 4 to 9 miles in width. It lies along the Rogue River. That country is located approximately 91 miles from Crescent City. We have developed a country as much as we could, with our excessive freight rates, along fruit lines principally, and in this fruit industry, gentlemen, we have invested in the Rogue River Valley alone over $20,000,000. We have 60,000 acres planted to fruit, all of which will come into bearing in five years' time.

Col. WINSLOW. What kind of fruit?

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Mr. BLANCHARD. Apples and pears. If it wasn't for the fact that we obtain the highest prices for our fruit we would not be able to make any profit. The poor man can't afford to buy our fruit on account of the distance that we are from New York and London, where we sell most of our apples and pears. We sell most of them in London. These 60,000 acres will produce, in five years' time, conservatively, 30,000 carloads per year. Six hundred boxes per car means 18,000,000 boxes per year. We are doing that per acre, and we expect to continue that and even do better. I am giving you a very conservative estimate. Now, then, it costs us, at the present time—and one of my colleagues here will present a table of freight rates showing you how we are, at that particular point, removed so far from our market that we pay the highest freight rates in the country. To get our fruit out it means a higher refrigeration rate and a higher crating rate and, therefore, to get a box of appes to New York City it costs us more than even to points in California, when it is only 400 miles to San Francisco. We pay $150 per car for refrigeration and $30 for freight. It costs us 84 cents per box delivered in New York City. If we were to have this harbor in Crescent City, and I want to assure the board that most of the development has been with the anticipation of this harbor, and railroad communication, we could cut the expense of a box of apples through the Panama Canal to 43$\frac{7}{10}$ cents, a saving of 39$\frac{7}{10}$ cents per box, which, if you please, amounts to over $7,000,000 per year.

Col. WINSLOW. How is this hypothetical rate figured through the Panama Canal?

Mr. BLANCHARD. I have obtained those rates by consulting with a traffic man of the Southern Pacific Railway, in San Francisco, and he estimates that 40 cents a hundredweight from Crescent City to New York City. Of course, if it should go higher or lower it would affect the rate just that much, but that is the basis of my figuring.

Col. WINSLOW. How much do you allow on the freight to Crescent City?

Mr. BLANCHARD. Six cents per box. Thirteen cents per hundredweight, which would be ample.

Col. ABBOTT. On the present basis?

Mr. BLANCHARD. That is simply an estimated rate between Grants Pass and Crescent City, a distance of 91 miles.

Col. ABBOTT. There would be nothing beyond the State Railroad Commission to control that rate. The improvement of the harbor would have no bearing on the rate.

Mr. BLANCHARD. It would be interstate. Of course, with the harbor at Crescent City we would have simply a rail haul of 91 miles, as compared now with a haul of over 300 miles (or 3,000 miles, if he was referring to the cross-country trip to New York, but I was unable to determine whether he was referring to the land haul to Portland or New York).

Col. WINSLOW. You would have the handling at Crescent City and the rehandling at San Francisco.

Mr. BLANCHARD. I think the same steamers would run right straight to Crescent City that go through the canal. Of course, there would be refrigeration.

Col. NEWCOMER. Have you figured on a rate to New York or Liverpool by way of Portland and the Panama Canal? Wouldn't that effect a considerable reduction?

Mr. BLANCHARD. The rate to Portland is practically the same rate as from Grants Pass to San Francisco. That would be approximately 20 cents per box from Grants Pass to Portland.

Col. NEWCOMER. San Francisco would be the better point if you have the same rate.

Mr. BLANCHARD. I think the rate to Portland is 25 as against 28 to San Francisco at the present time. We don't ship apples to San Francisco to sell. We haven't any market there. We ship them through.

Maj. KUTZ. The saving would be the difference in the freight rate from Grants Pass and San Francisco and Grants Pass and Crescent City?

Mr. BLANCHARD. Yes. In a way that would be true.

Maj. KUTZ. That would be a saving of 22 cents per box.

Col. WINSLOW. You could probably get a better steamer rate from San Francisco. The saving would be due to the Panama Canal. The main saving I mean.

Mr. BLANCHARD. Yes; the main saving would be due to that. But either way you want to figure it, even a few cents per box will figure a saving to us in our fruit crops of millions of dollars at the end of five years. It would have saved

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us this year, approximately, somewhere between two and three hundred thousand dollars.

Col. NEWCOMER. Of course the essential features in that saving are the opening of the Panama Canal and the railroad access to Crescent City. You can ship from there at present, if you can get access to Crescent City, so that the main part of this saving would result from the construction of the railroad and the opening of the canal. The expenditure is not essential to enable you to secure this rate.

Mr. BLANCHARD. Your position there would be assuming that we were going to sell our apples in New York, but most of our apples and pears would be sold in London; because if we could ship direct to London and Liverpool we would have some saving.

Col. WINSLOW. You can ship by San Francisco.

Mr. BLANCHARD. It would be the difference in cost of getting it to San Francisco. I think the difference is very little. I think the rate would be very little different.

Col. WINSLOW. Still, if it only costs you 28 cents to get there now, the difference there in the saving will be due to the opening of the canal and Crescent City Harbor. It would probably not be more than 20 cents.

Mr. BLANCHARD. Even that, I say, would be a tremendous saving for the people of our valley. Now, the people of our valley have evidenced their good faith in this matter. We have been dreaming of a harbor at Crescent City for years. As I say, our fruit was planted, our people all figured upon that being the shipping point for our products, and as a consequence the people of Grants Pass have voted a bond issue of $200,000 upon their small community for the purpose of building, as far as they could, a railroad to Crescent City. We have 10 miles of roadbed completed. We have a completed cross-section survey. The grade is less than 2 per cent.

Col. NEWCOMER. Is it a part of the Southern Pacific?

Mr. BLANCHARD. That is an independent enterprise. We have been waiting for the Southern Pacific for 25 years to build that. We have purchased 18 miles of right of way out of Grants Pass and approximately 15 miles out of Crescent City. The balance is over the public domain and is being arranged for. No doubt it will be easily obtained. We have 28 acres of terminals in Grants Pass and sufficient terminal space at the other end.

In other words, gentlemen, our community there has made up its mind that we must do something for ourselves in order to get this transportation to the coast.

Col. NEWCOMER. Is this railroad that you have started to be carried through to Crescent City as a public road?

Mr. BLANCHARD. It will not be completed by the people of Grants Pass. They can't afford to do that. We have simply started it with the determination of running it out as far as we can. But we expect, of course, that some one will complete that railroad to Crescent City in some manner. Mr. Reddy is here. He will handle the railroad situation. I desire to talk about some other figures that would seem startling to this board I know, and that is the timber that is now standing in these counties to be benefited. There are over 120,000,000,000 feet of timber in these counties to be benefited by this harbor when the railroad is completed to Crescent City. Approximately 80,000,000,000 feet of that is owned by the Government in the forest reserves. Now, those seem to be startling figures, but the State of Oregon has standing timber now of almost 450,000,000,000 feet of timber, so that we only have a small portion of the aggregate amount of the standing timber of the entire State. Gentlemen, there is practically 60 per cent of this timber that is fir. Anyone that knows anything of timber knows that trees mature, and when they mature, if they are cut, they are a fire menace to the country. The redwood is not. But in the interior country the trees burn, and this ripe fir is also a menace to the good fir and other pines. Fir can not be marketed profitably. There isn't a stick being cut. The reason of that is this, that it costs $7.50 per thousand to get that fir by railroad to San Francisco.

Col. WINSLOW. Just the railroad?

Mr. BLANCHARD. Yes. The margin is so small there is no profit in it. It means that this fire menace is still standing there. The people of the world can use this timber of the Government. We will take a point, for instance, as Grants Pass, perhaps the center of the district to be benefited by the harbor at Crescent City, and estimating that it would cost $2 per thousand to get 1,000 feet of lumber from the center to Crescent City, would be a total saving of $5.50 per thousand. This, gentlemen, would enable us to manufacture our

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fir. It would enable the people of the world to use fir, 60 per cent of which is mature. A total saving of not only the lumber but in freight rates of $660,000,000 upon the total aggregate of 120,000,000,000 feet of timber. Those are enormous figures.

Col. NEWCOMER. Of course, that timber isn't all available by the construction of this 90 miles of railroad.

Mr. BLANCHARD. Of course not, but whenever there is a trunk line railroad built it will be. There usually are little offshoots. We have some places where they flume lumber 25 and 30 miles. Then they would have logging railroads and, of course, most of it would come out that way. It wouldn't all be benefited by this one road.

Col. WINSLOW. When these fir forests are cut do they reproduce?

Mr. BLANCHARD. They are pretty strict out there, especially on the Government's reserves of timber. It is cut under very strict regulations. Certain trees must be cut, and no other trees cut, so as to leave trees to grow, and to cut out the fire menace so far as the brush menace is concerned.

Congressman HAWLEY. I know that the Douglas fir has attained a diameter of 80 inches at the bottom.

Mr. BLANCHARD. The redwood trees in California are over 3,000 years old. They are very old. I am not going to take up any more of your time. These statements that I have given you will be presented in printed form.

Mr. HOTCHKISS. The Hon. John L. Childs, superior judge of Modoc County, in relation of the forest timber to the project. I believe there is a letter from the Forestry Department which I think the judge will want to see.

Judge CHILDS. Gentlemen of the board: The portion of this argument that has been assigned to me is on the forest reserves of that community. Now, I will state, however, before I start in on that, that in 1852 and from then until the Southern Pacific built through northern California and Oregon that all the balance of southern Oregon, from Roseburg down and in northern California to Yreka, in Siskiyou County, was shipped through Crescent City, and if at that time we had had a live man in Crescent City the railroad would probably have been constructed at that time and we would have been able to have retained that business. Now, it has been mentioned about the first expense. Of course, Col. Rees has reported to this board that the future expense will be about so much per year, but our harbor, as you well know, and the improvement of the harbor are going to be built upon reefs and rocks and tied to rocks at the outside, and the expense will not be so great to keep that in repair as it would be to keep a harbor at Eureka in repair. I would state further that we are doing business at Crescent City now and shipping there some lumber and other materials, and we have a harbor there now in the summer time and we have protection from the north winds and the northwest winds. This last winter it took one of our boats 26 days to make a trip, which takes about 350,000 feet.

Col. NEWCOMER. The ordinary time being how much?

Judge CHILDS. One week. Our vessels make a pretty regular trip, once a week.

Col. WINSLOW. How large are these vessels?

Judge CHILDS. The largest vessel that comes in takes about 400,000 feet of lumber and draws about 12 feet of water.

Col. WINSLOW. Are they sailboats?

Judge CHILDS. No; we lost many sailing boats during that period of that work. The boat must have power to take it out. Now, gentlemen, you understand that a large amount of our territory has been taken away by the Government for conservative reasons. That timber is valuable if we have transportation to take it out. The Government could sell that timber now—all the ripe timber—and the letter that is here now, a copy of which I have, from the Forestry Department, give me a copy—shows the amount of ripe timber, and you will find—let me see—over 31,000,000,000 feet of ripe timber that is going to deteriorate, and of course, it has been suggested, is of damage to the forest reserves because it is a menace. [As Judge Childs made, at this juncture, a number of references to this letter, which references were not recorded, under instructions, the letter referred to is here copied and made a part of this report, as requested.]

DEPARTMENT OF AGRICULTURE, FOREST SERVICE,
Washington, Apil 6, 1914.

Hon. WILLIAM KENT, *House of Representatives.*

DEAR MR. KENT: I inclose a copy of a statement which has been prepared by the Forest Service for Judge J. L. Childs, of Crescent City, showing the timber

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resources of a number of forests in northwestern California and southern Oregon. As you know, we are endeavoring to find a market for the ripe timber in the National Forests which should be cut, and you know also that we have had many difficulties in finding immediate markets on account of lack of transportation facilities. Anything which would stimulate the development of railroads and other means of transportation would of course assist in opening up of markets for the utilization of National Forest timber.

Very sincerely, yours,

H. L. GRAVES, *Forester.*

APRIL 6, 1914.

Mr. JOHN L. CHILDS, *Raleigh Hotel, Washington, D. C.*

DEAR SIR: In response to your request for information concerning the timber resources of the Trinity and Klamath National Forests, in California, and the Fremont, Paulina, Deschutes, Umpqua, Crater, and Siskiyou National Forests, in Oregon, I am very glad to give you the following information from the files of this office: The estimated aggregate amount of timber which is mature within those forests is as follows:

Forests.	Aggregate M board feet.	Mature M board feet.
Trinity	13,528,000	5,560,000
Klamath	16,017,532	6,310,520
Fremont	6,360,000	2,000,000
Paulina	4,910,000	900,000
Deschutes	4,176,000	2,200,000
Umpqua	20,260,000	7,040,000
Crater	7,627,000	1,210,000
Siskiyou	11,600,000	6,000,000
Total	84,478,532	31,220,520

I regret that I can not give you the volume of timber on these forests by species. Portions of these national forests have been cruised and this information obtained, but it can not be given to you for the entire forest. In order to give you an idea of the percentage of species on various tracts within these forests which have been cruised and which are of record in this office, there is listed below a number of such tracts, giving for each the quantity of timber by species, the percentage of volume by species and the appraised stumpage price, where no sale has been made, and the price obtained for the timber under competitive bids where a sale has been made.

Trinity National Forest.—1. On an area embracing 219,000 acres, extending from the western portion of the forest on Grouse Creek to the eastern part near Wildwood, and including the watersheds of Mosquito, Eltapom, Corral, Miner, Little, Big, Barker, and East Fork Creeks, there is estimated to be one billion feet of merchantable timber, of which 58 per cent is Douglas fir, 19 per cent yellow pine, 12 per cent sugar pine, 10 per cent white fir, and 1 per cent incense cedar.

2. On that portion of the slopes of Grizzly and Pine Mountains draining into the Eel River watershed in townships 2 and 3 south, range 6 east, there is estimated to be 97,910,000 feet of national forest timber, of which 42 per cent is yellow pine, 41 per cent Douglas fir, 12 per cent sugar pine, 2 per cent white fir, and 3 per cent incense cedar.

Klamath National Forest.—The Forest Service has had a cruise made of the timber in the upper portion of Klamath River. For convenience, the area cruised was divided into three units—Lumgrey and Horse Creek unit, Hamburg and Nolton unit, and Indian Creek unit. In the Lumgrey and Horse Creek unit, which comprises the timber in Lumgrey, Beaver, Doggett, and Horse Creeks, there is estimated to be 544,000,000 feet in the following proportions: Douglas fir, 34 per cent; yellow pine, 23 per cent; sugar pine, 22 per cent; white fir, 14 per cent; red fir, 3 per cent; incense cedar, 4 per cent. On the Hamburg and Nolton unit, comprising the timber on Hamburg, Seiad, Bittenbender, Portuguese, Fort Goff, Tims, Thompson, and Nolton Creeks, there is

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estimated to be 799,500,000 feet in the following proportions: Douglas fir, 61 per cent; yellow pine, 12 per cent; sugar pine, 22 per cent; white fir, 4 per cent; incense cedar, 1 per cent. In the Indian Creek unit, comprising the timber in Indian Creek, Doolittle, East Fork, North Fork, and South Fork Creeks, there is estimated to be 1,401,500,000 feet in the following proportions: Douglas fir, 63 per cent; yellow pine, 5 per cent; sugar pine, 23 per cent; white fir, 5 per cent; red fir, 1 per cent; incense cedar, 2 per cent; Port Orford cedar, 1 per cent. The appraised value of the timber on these units is as follows: Lumgrey and Horse Creek unit, sugar pine, $3.75; yellow pine, $2.75; Douglas fir, $1.25; other species, 75 cents. Hamburg and Nolton Creek unit: Sugar pine, $2; yellow pine, $1; other species, 50 cents. Indian Creek unit: Sugar pine, $2; yellow pine, $1; other species, 50 cents.

Deschutes National Forest.—An estimate has been made of the timber in the basin drained by the Big Deschutes River in the southern part of the Deschutes National Forest. The principal tributaries to this river on the area cruised are Fall River, Davis Creek, and Brown Creek. The total quantity of timber on the area is estimated to be 177,200,000 feet, of which 98.5 per cent is western yellow pine and the remainder sugar pine, Douglas fir, white pine, and lodge-pole pine. The appraised value of this timber is $3.75 per M feet for the sugar and yellow pine, and $1 per M feet for the Douglas fir, white fir, and lodge-pole pine.

Umpqua National Forest.—A sale of timber was made on the Umpqua National Forest in February, 1913, on an area of about 3,060 acres in the Row River watershed, comprising portions of sections 18, 20, 21, 29, 31, and 32, and all of sections 19 and 30 in township 21 south, range 1 east, W. M. The total quantity of timber involved was 163,100,000 feet, consisting of Douglas fir, western hemlock, western red cedar, and sugar pine, of which 97 per cent was Douglas fir. The stumpage price was $1.25 for the Douglas fir, western red cedar, and sugar pine, and 50 cents for the western hemlock.

Crater National Forest.—1. In May, 1911, a sale of 103,512,000 feet from an area of 7,120 acres on the watershed of Varney Creek, within the Crater Forest, was made, comprising yellow pine, Douglas fir, and associated species. Sixty-two per cent of the timber was yellow pine, 21 per cent Douglas fir, 10 per cent white fir, and the remainder associated species. The prices obtained were $3.25 for the yellow pine, sugar pine, and white pine, and $1.50 for the timber of other species. 2. It is estimated that there is within the watersheds of the Middle Fork and South Fork of Rogue River 120,000,000 feet of timber, of which 70 per cent is Douglas fir, 20 per cent white fir, 5 per cent yellow pine, 3 per cent western hemlock, and 2 per cent sugar pine. 3. The timber on Four Bit Creek, a tributary of Rogue River, is estimated at 98,000,000 feet, with an area of 8,000 acres. The percentage of species is as follows: Western yellow pine, 71 per cent; sugar pine, 0.7 per cent; Douglas fir, 21.7 per cent; white fir, incense cedar, and lodge-pole pine, 6.6 per cent. The appraised value of this timber is $3.50 for sugar and yellow pine, $1.50 for Douglas fir, and $1 for white fir, incense cedar, and lodge-pole pine. 4. It is estimated that there are 59,000,000 feet of timber on Three-Mile Creek in townships 33 and 34 south, range 6 east, W. M. The proportion by species is as follows: Yellow pine, 56 per cent; Douglas fir, 8 per cent; white fir, 24 per cent; noble fir, 7 per cent; other species, and dead, 5 per cent. 5. It is estimated that there are 110,000,000 feet of timber on the Elk Creek watershed in township 31 south, range 2 east. The species and percentages are as follows: Sugar pine, 21 per cent; yellow pine, 3 per cent; Douglas fir, 47 per cent; white fir, 17 per cent; noble fir, 7 per cent; incense cedar, 5 per cent.

I believe that you will be able from the above information to gain some conception of the variation in the percentage of species as they occur on these national forests and a general idea of the prevailing stumpage prices. There is inclosed a mimeographed statement outlining the methods of making timber sales on the national forests which will doubtless be of interest to you. The Forest Service desires to have utilized by sale as much of the mature timber on the national forests as can be safely cut, and for which there is demand. Many mature stands of timber on the forests herein named are inaccessible at the present time and can not be marketed until some means of transportation is provided which will permit its exploitation at reasonable cost. I feel that railroad development particularly would afford a means of securing a market for considerable bodies of timber on these forests. Where the construction of railroads is concerned essential to remove timber products, full consideration of the

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cost of the construction is given in making the timber appraisal. It is the practice, however, in allowing for these costs, to have the national forest timber involved bear no more than its proportion of the total construction cost. Where a railroad suitable solely for logging transportation is planned, the cost is charged against all timber which is accessible to it. If, on the other hand, a common carrier railroad is proposed, the cost is further distributed to cover other sources of revenue, such as mineral and agricultural resources, passenger and freight traffic, etc. I trust this will give you the information desired.

Very truly, yours,

W. B. GREELEY, *Assistant Forester.*

Maj. KUTZ. Is the railroad west built from Trinidad to Crescent City?

Judge CHILDS. Part of it * * * from the Klamath River. But it is 50 miles by wagon road from Trinidad to the mouth of the Klamath, and it is only 20 miles from the end of the present railroad running south, toward Requa, to the Klamath River. It is 2½ times farther to Trinidad than it is to the Klamath.

Mr. HOTCHKISS. It is a physical impossibility to put a road down the coast there. You can put it on the map, but that is the only place it ever will be. It will be on the map, but not on the coast.

Judge CHILDS. Now, gentlemen, I take it for granted, of course, you people are engineers. We are farmers that are coming here. We have had very little educational advantages or any kind of advantages, and we have traveled farther than any committee ever traveled. We have to go to Grants Pass, Oreg., and travel 400 miles to come east, so we are farther away from you than any other committee that has ever waited upon this honorable board. I take it for granted that you gentlemen realize the fact that the timber industry—that the logs must be taken out over the lines of least resistance. That is, they must be brought down the creeks and rivers and hillsides rather than over the hills and mountain sides.

Col. WINSLOW. Can you run timber down the Klamath River?

Judge CHILDS. Yes; for a distance at least. I don't know how far. I am not familiar with the Klamath River. I am familiar with the Rogue River, and will talk about that a little later on. Now, I wish that you people, I want to state to you, from this map I have prepared—just a map which I saw uptown and I bought it from a book store for 25 cents and cut it off so I wouldn't have so very much to deal with—and that map shows you the contour of the country; that is it shows you the lines of least resistance over which timber will pass to get to tidewater, and if you will notice that map you will find that the northern part of Humboldt County, about 720 square miles of Humboldt County, will go into either the Klamath River or Trinity River, and come down that way. You will find that nearly every foot of Trinity County is drained by Trinity River with the exception of a little part of the southwest corner through which the headwaters of Mad River run. There is a little current down there that will send its timber down the Mad River. The rest of Trinity County will have to send its timber over the mountains in order to get into Humboldt County or to Eureka without coming first to the mouth of the Klamath River. You will also notice that nearly every portion of Siskiyou County is so drained as to be cleared of its timber to Crescent City. You will find that Modoc County and the eastern part of Siskiyou County is a plateau, high and pretty level. It is not mountainous. All this country in eastern California is a plateau country about 4,000 feet in altitude, and the natural outlet of all this country is Crescent City. If you will examine the map further you will find that Curry County, Oreg., is in the Rogue River Valley and south of this. It is 50 miles from Crescent City by sea, as I measure the map, to the mouth of Rogue River. Little vessels can go into the mouth of Rogue River, vessels with a draft of perhaps 6 feet, possibly 8 feet, can go into the mouth of that river, and all the lumber below the railroad that we are attempting to build from Crescent City through the Illinois Valley and over Grants Pass, all that lumber could be taken to Crescent City in these smaller boats and there reach smaller markets, if we get our harbor improvement. Nearly all of Curry County, you will find, will be taken care of in that way. Josephine County, you will find, is practically all drained into the Rogue River. Practically all of the timber of that county will come out to Crescent City.

Four hundred and seventy-five miles from Grants Pass to San Francisco or 300 miles to Portland, is what it has to go now. Jackson County, you will find, is drained almost entirely by Rogue River. It winds in the Crater Forest Re-

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serve. We have a railroad from Medford, Oreg., 20 miles east of Grants Pass, and there is a railroad started over in this county, over into the Klamath Lake country. It is built out from Medford 32 miles to Butte Falls, and is surveyed over to the lake and then north to Bend, Oreg. That 32 miles of railroad belongs to the Hill people. They have made this survey, and at one time they were going to build the road, but at present they are doing nothing with that. The construction of 30 or 40 miles of that railroad to Klamath Lake will be necessary before they receive any great benefit from the harbor, and they are as much interested in the harbor improvement at Crescent City as the people of other points that are nearer. I want you to be really and truly satisfied.

Col. NEWCOMER. Does this show the railroad construction properly? [Discussed map and construction of railroad, but the discussion was too rapid for recording.]

Col. WINSLOW. I thought the Central Pacific and Southern Pacific were different.

Judge CHILDS. They are trying to make them different. Now, gentlemen, in Del Norte County we have 30 townships, in Humboldt 24, Trinity 66, Siskiyou 192, Modoc 130, Curry 35, Josephine 48, Jackson 72, Klamath 170, Lake 247, Harney 66, Douglas 75, making a total of 1,155 townships that would be relieved, in my opinion, by the construction of a harbor at Crescent City, because, if we have a harbor, just so soon as we know we have a recommendation for this harbor, the railroad will be prosecuted to completion. I am just as sure of the railroad as anything, if we get a favorable report. That means that we have there a territory that we claim to be, adjacent to the city of Crescent City, of 41,580 square miles, an acreage that is simply immense. The country there is 21 times as large as the State of Delaware, eight times the size of the State of Connecticut, and 5 times the size of Massachusetts. Over that country—I won't go into detail in regard to that matter, because I know you people are busy people and haven't much time to give to us, and so I will leave that just as it is. Here is another map. I went to the Forestry Department and found some maps and tore off the parts that I didn't want and have it in small form there so that you could see the territory I am talking about. There are several forest reserves in this 41,000 square miles that I am speaking of. The Trinity Forest Reserve has 13,528,000,000 feet, board measure, of merchantable timber. (See page 64 of this hearing.) Five and a half billions, approximately, of that timber is ripe now and ready to be cut, and could be sold at what the Government is asking for it if we had transportation facilities and the milling companies built railroads to the timber.

The day is past when they use rivers very much to float logs down. Railroads are built. It pays them to build railroads, and I believe that if we had a harbor, so that we can ship at all times of the year, that manufacturers of lumber will come in there and buy from the forest reserves the timber that is for sale in all of these reserves as fast as they can get transportation facilities. In the Klamath Forest Reserve you will find—(refer to p. 64), and this paper is left here so that you can look at it—there is over 16,000,000,000 feet. In Fremont National Park there is over 6,000,000,000 feet. In Paulina National Park there is over 4,000,000,000 feet. In the Deschutes National Forest Reserve over 4,000,000,000. In the Umpqua, over 20,000,000,000 feet. The Umpqua is in the eastern part of Douglas County. You have to go north. Now, in point of distance, it belongs to Crescent City. There is no great altitude for it to come over between Grants Pass and Crescent City. It is only 1,900 feet. Now, in point of distance, Douglas County belongs to Crescent City. In order to get to Coos Bay you have to go north to Eugene and then south 190 miles by rail. Now, altogether, in all of those forest reserves, this country—the United States of America—owns over 87,000,000,000 feet of lumber, and in this letter from the Forestry Department (p. 64) the Forester tells you what they are asking for the timber and the percentage of the different kinds of timber. Douglas fir 63 per cent, yellow pine 5 per cent, etc. Three dollars per thousand for their yellow pine. Twenty-three per cent of sugar pine—in this particular part that they have estimated and that they ask three and three and a quarter for. [Reading from letter.] For all the other timbers they ask about $1 per thousand, but if it is worth $1 it would mean $87,000,000 being paid into the Treasury of the United States from that timber.

Now, from the looks of these figures there's 30 per cent that is ripe and ready to cut. It isn't worth 5 cents to the Government to-day and never will be worth 5 cents to the Government unless they can remove the logs and mature lumber.

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We are asking for an improvement that will tend to build up railroads and give rise to manufacturing that lumber. Without a harbor at Crescent City the capital will not invest itself there in a proposition when they might have to wait 26 days in order to load a quarter of a million feet of lumber. In these papers I find [not recorded]. But I understand that one committee doesn't go to another very much and express itself as in favor of or against a project. Now, this Forester Graves was very reticent about saying anything, and he was afraid that the people at Eureka might be haughty because he recommended that some of the timber come out at Crescent City so he was not inclined to say much about that, so he sent this letter, also the other, to Mr. Kent. But finally he gave to Mr. Kent this letter. It is addressed: Hon. William Kent, etc. [see page 63 for copy of this letter.] Now, he gave that letter to us. If we get the harbor—if you recommend that a harbor be constructed along the lines of the report given you by Col. Rees you may take it from me that we will get this 91 miles of railroad. There are people who can build it. Mr. Hotchkiss can build this railroad if he wants to. So I suppose the railroad will be built if we get a favorable report from your honorable board. I think that I won't say much more about this matter. If you will look that map over and, of course, I know that you are familiar with the contour of that part of the country, as you are with every part of the United States, you will find that that territory which I have mentioned belongs to Crescent City, and that lumber, when it is removed, will be removed from Crescent City. There is 87,000,000,000 feet that I know of. I call it 80,000,000,000 feet of lumber. We will say that is worth $1 per thousand. There is $80,000,000 that it would be worth to the Government. Now, that is a small part of the worth of the timber to the community.

The community in which that timber is growing will get for the price of labor, etc., $640,000,000 in the manufacture of it. It will probably be 50 years before it is manufactured, of course. We get $8 per thousand for cutting the logs, sawed up, etc. It costs $8 per thousand to manufacture and load on shipboard the pines and fir of our coast. It is worth to us $640,000,000. Now, if the manufacturer makes $2 a thousand on it he does very well, but if he did make $2 per thousand he would get $160,000,000 out of the timber. The transportation at $3 by railroad and the ocean haul making it very low. But the transportation company will get $240,000,000. We would get from that timber, if we get a harbor so that the Government can sell that timber at all, we will get a total of $1,120,000,000 out of that forest. The forest, gentlemen, has been taken out of the market. We can't buy that forest. The Government owns it and the Government doesn't pay any taxes on that timber, and we feel that the Government ought to help in building wagon roads and harbors and even railroads to improve the country where it owns the property and will not sell it. We have a little belt of timber there at Crescent City right on the border of the ocean. About 20,000,000,000 feet that we have there, and the timber owners that own it are paying sixty thousand toward our county government and a little toward our State government. Now, at the same rate, if the Government was paying taxes on the timber to the various counties, it would be paying $240,000 a year in taxes, and in 10 years would pay $2,400,000 in taxes alone. Now, we feel that this is a matter that should have your serious consideration, and I know it will have. I want you to go over my figures, and I think you will find the contour of the country correct. I thank you very much, gentlemen.

Col. ABBOTT. There is another delegation that has the promise of a hearing, so if you could get the other speakers to close as rapid as you can it would be appreciated.

Mr. HOTCHKISS. You hear the desire of the board. I would like for Dr. Reddy to be heard upon this railroad question.

Col. ABBOTT. There is a great deal of repetition which could be omitted.

Mr. REDDY. I would prefer not to say anything unless I was assured that I could have at least a half an hour. I would rather stay here a week, because what I have to say is of importance, but I don't want to discommode the board.

Col. ABBOTT. Is this on a new point?

Mr. HOTCHKISS. Will this be the last?

Mr. REDDY. I will start in by answering a question that I thought wasn't properly answered at the time it was asked. That was "Would the freight go in over the new line or over the Hill line if a road from Grants Pass to Crescent City was built?" Now, that is very important. At the present time the people in this area here are paying about $4,000,000 a year for freight, and if this road from Crescent City to the interior were built and completed to-morrow all of the freight of that country would go in over that road for this reason: At the

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present time it is being shipped 300 miles south or 470 miles north. Coming from the north it climbs 4,125 feet, or practically 5,000 feet, because they make two climbs. Coming from the south they climb about 1,500 feet. Coming from the coast they would only climb 1,900 feet. It is impossible for one railroad to go 5,000 feet up and 470 miles and compete with the other fellow, and for that reason it would reduce the four million down to about two, making a saving of $2,000,000.

Col. ABBOTT. At the present freight rates?

Mr. REDDY. Yes. If the road were built and the harbor were built the business done would probably be 10 times what it is now.

Col. NEWCOMER. To what territory did that estimate apply?

Mr. REDDY. I claim from the town of Merlin to Ashland, Oreg., on the Southern Pacific, a distance of about 55 miles—practically the Rogue River Valley. Now, the completion of the road a little farther into the interior, toward Klamath Falls, would add as much more to that.

Col. NEWCOMER. Of course, that means your present freight on fruits going out.

Mr. REDDY. Yes; which at this time doesn't amount to much. Now, something was said, and I hate to repeat this, but it wasn't explained very satisfactorily. A road down the coast, or up the coast, wouldn't help this 60,000 acres of fruit in the Rogue River Valley for this reason: We have a railroad now. We are shipping now 3,000 miles. We want to get to the coast in 91 miles, which we can't do. That is the only thing that will give us relief. There is $30,000,000 invested in fruit in this valley now, and they depend entirely on this harbor. At the present time we are only shipping 1,000 carloads of fruit. Our acreage is only about two or three thousands—that is, producing. This 60,000 thousand acres was planted on the strength of the results of that 3,000 acres. Now, when the 60,000 acres come in we are in a different position. At the present time we are selling all of our fruit in Europe. You can't raise grain, barley, wheat, and ship it to the coast via Portland or San Francisco. There is only one product that I know of that you can engage in in Rogue River Valley and that is fruit. The fruit will start this enormous freight. Now, when we come to ship 30,000 carloads we have got to seek a different market. At the present time we don't sell anything in America. The European market at this time would consume 30,000 cars of fruit. We have got to ship this now when we can do that, and we have a market for our product, but if the 60,000 acres of fruit were to come in bearing to-morrow we couldn't ship it. It would stay in the valleys. We couldn't pay the freight.

Col. ABBOTT. The European market wouldn't take all of this high-priced fruit?

Mr. REDDY. I investigated that in Europe and I found that our apples were selling for $5 or $6 at the present time. Now, the number of people that can afford to pay that in Europe are limited. We have got to ship apples to the people who can afford to pay $1.50 a box for them and that is only possible by the building of the Panama Canal. Most of these fruit trees were put out on the theory that we were going to have transportation. The big element is the mine. A copper mine will produce more tonnage, more employment, and more wealth than a whole county will of fruit. It will give employment to a better class and a higher class of people, at a better wage. This district here, 100 miles wide and 100 miles long, has got more mineral in it than any other part of the United States. It has more copper blocked out at this time than any other district in the United States. I am quite familiar with copper in Alaska. They have 20,000 feet of work done in Alaska, where we have 400,000 developed in our district here. We have tons of copper here where they have pounds. The biggest copper men in America have run in there and developed the mines and the tonnage is there waiting and the tonnage will never get out of the country unless it goes via Crescent City. Why won't it go out? It won't stand the haul. You can't ship copper 40 miles into the railroad and then 300 miles to Portland and then 150 miles to Tacoma. You can't ship it 400 miles to San Francisco and 40 miles locally. The Government won't allow you to smelt it in the interior on account of the fumes. The result is that it has got to come to the coast. Now, up to date, they haven't opposed the smelting of copper ores at any point on the tidewater. These copper mines are worthless unless they can get to Crescent City. Now, they are on the watershed of what leads to Crescent City. They can't cross over the mountain. It won't stand it. The result is it can't be shipped. We haven't one mine or two or three.

We have a copper belt there that extends from Redding, Cal., to Rogue River, a distance of 150 miles. We are taking part of that. The copper belt is about 40 miles from the coast and about 45 miles from the railroad. It is in between

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the transportation points at this time. The building of this road to the harbor would put some 20 or 30 mines on a paying basis; or in other words, if the people out there were sure that this railroad and harbor would be built, probably 7,000 or 8,000 miners would be employed in there in the next four or five months. They wouldn't build a railroad to Crescent City unless a harbor were there. About the railroad, there is one gentleman here that has built 18 miles of this spur. He has a million tons of ore blocked out, awaiting transportation. About the railroad property, I am trying to, with the aid of the citizens there, build a railroad from Grants Pass to Crescent City. I have got about a third far with it. I got the city of Grants Pass to vote a bond issue of $200,000, and for that amount we will complete 11 miles of it. On the other end Mr. Hotchkiss has 11 miles of completed railroad. I have made an arrangement with him whereby he is to turn that railroad over to my company and in addition to that he has agreed to turn over $150,000 in cash, as a bonus of that. Now the people of Crescent City have agreed to put up $100,000 to be paid on condition that a road was completed. You know it is quite a hardship on that small community to put up $350,000. That shows that they believe in this proposition. If I could say that we could get the harbor, there is no doubt about finishing the strip of country between the two points. That 70 miles of railroad would be a small item, if we can just get the harbor. I don't know—I am going to try to get the railroad, so that it would bring in so much tonnage to that harbor. Instead of waiting for tonnage to be developed, we are going in to show the Government that the tonnage is there. I have spent $30,000 on it in a year's time, and I am not a wealthy man. I have spent about $50,000 to investigate in this country in the last 10 years. I have investigated the timber, the crops, the gold, the soil, the coal. We have as much coal as you have in Alaska. All this fuss about the coal in Alaska is nothing. We have 10 feet where they only have 1. But there wasn't a word said about it. It is a lignite coal. If we could get at it, it is just what we want. We are shipping coal in now from Wyoming and there is coal 8 or 10 miles from us.

Col. WINSLOW. How much do you pay for the coal?

Mr. REDDY. I pay $1 a mile per ton.

Col. WINSLOW. That makes it pretty expensive.

Mr. REDDY. Rather. That will be reduced. I had to pay that price because it was over bad roads. Now there isn't any question about the railroad. We can guarantee a railroad in mighty short time if you would say that we could have this harbor. Now, the people in this country, at the present time, are the worst gouged 70,000 people that are in America. They are paying more per capita than any other people in the United States. They are the "mid-ways." This is the only 900-mile stretch in America that hasn't got two railroads. We are in the center. I went to get a freight rate on rails. The freight rate from San Francisco to Grants Pass on rails was $14.80 per ton, while the rate from San Francisco to Portland was $4.80, making a discriminating rate of $10 per ton by dropping them off at Grants Pass. The freight rate from Portland to Grants Pass was $11.40, and $4 from Portland to San Francisco. Now that thing applies to other commodities as well as rails. This community has been going backward. They haven't got as many people now as they had in the fifties. There are less people there. The country is denuded of its cream. At one time, when this railroad went through here, it went through forests. The timber along the waterway has been shipped out. Now they have to go back 3 or 4 miles. The copper ore of that country they had been shipping for 25 years. All the cream that would stand a $10 wagon haul. Now where the country has 1 ton of ore that will stand a $10 wagon rate, they have 1,000 tons of stuff that won't stand it. At the present time, you take Josephine County. In 1911 it paid the railroad company $300,000 for its freight. The county only produced $150,000, leaving a deficit of $150,000. In 1912 it repeated that. Jackson and Josephine Counties didn't take in as much for 1911 as they paid for gasoline for their automobiles. These people are waking up. This committee that was sent here was sent by the county court of Jackson County, the city of Grants Pass, etc. Now, when these little communities will appropriate money to select citizens to send you, they certainly are in need of recognition. That is this: All their mines and all the lands in that country are worthless under the present conditions. There is one item that you can produce—fruit. If you produce it in any larger quantities than you are producing it now, you won't find a market for it. Now you people, if you get a dollar a barrel for your apples, you are doing pretty well. But we have to produce apples that must bring $3 or $4

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per box unless we get the conditions changed. If you people don't grant this request we will have to be back here later. It is the richest part of the United States.

Col. NEWCOMER. How did you get the automobiles? Did you mortgage your prospects?

Mr. REDDY. No. In the last five or six years 20,000 people have gone into the Rogue River Valley from the East and those people have invested $30,000,000 there, and I want to tell you they have never realized anything on it. These investments they made were made on the basis of a little 3,000 acres of fruit land. Now they have got to put in $10,000,000 more when this 60,000 acres comes in bearing, making a total investment of about $40,000,000. It depends entirely on this harbor. Another point: All of that land is practically worthless at this time to anybody. There isn't anything you can produce only what you can produce for the local market. You can't ship anything out. That freight rate won't permit you. The result is that there are several million acres of land there that are worthless, and you will reclaim every acre of that land if you build this harbor. It will all get people on it. It can ship 90 miles as against 300. The Government has been investing money in the reclamation of various kinds of lands. There isn't any reclamation project that has been up to the Government that will reclaim as many acres of land as this will and at the same time give them a harbor. This country at this time is the richest part of the United States. If we were close to Washington or San Francisco they wouldn't be there. And we think that we are in hard luck because they are there and we can't get them out. But the whole country depends on this harbor. I am sorry that I was rushed, because I know a lot about the country. I have the engineer's reports. I had Mr. Stevens go through this country on the investigation made, with me, and at my expense, when he built these two railroads. He built one road and the Southern Pacific built the other one. There is 140 miles stretch there of plateau. There wasn't but one house on it. Well, Mr. Stevens said, "I am going to build a railroad in here; I am going to throw up the grade first, and it will take me a year to come up here, and the people will get in a year ahead of me and will have something for me when I get here." About 15,000 people went into that stretch of country, and 15,000 went out again because they didn't build the railroad.

Maj. KUTZ. Is that built [pointing to map]?

Mr. REDDY. No; that is prospective. There are no through connections.

Maj. KUTZ. Well, if it was, wouldn't that help you?

Mr. REDDY. No; it wouldn't help us a particle. We must get to tidewater. There is a 75-mile gap. Two-thirds of it would be tunneled. But that wouldn't help these people. This railroad is the thing that is going to pay. That would give us some relief at least. If there are any questions you would like to ask—but, by the way, we have lime there, we have coal, we have gold, we have lead, silver, iron—several million tons of iron—sticking out of the ground there. Iron is no good if you have 50,000,000,000 tons of it if you couldn't get it out. Some day it may be of some value. They used to ship iron from Crescent City to Baltimore in the fifties or sixties. There are two or three million tons of it there now. Thank you, gentlemen.

Mr. HOLTER (or HOLTEN). Why, I journeyed over here from New York on my own initiative. My friend, Mr. Childs, told me there was going to be a hearing. I don't live there and I am not inflated by atmospheric enthusiasm. I was born in a mining camp in Montana and I feel a real sympathy for the miner in any section of the country. As far as this country is concerned: About eight years ago one of the most successful mining engineers in this country spoke to me about this country—told us it was an undeveloped country but of potential value. We said: "All right, go ahead, and we will share the expenses, at a point on Indian Creek, from Crescent City." We went to work and we have been working there intermittently about eight years. We have developed actually a very large tonnage of ore. I have been in the habit of discussing matters of this kind with engineers and lawyers, and I don't mean to state anything that I can't prove by any number of engineers' reports, and I think that I am safe in saying that we have measurable ore in our property there of 500,000 tons of 5 per cent copper ore, which is of a gross value of $6,000,000. The amount of copper measurable is determined by tunneling * * * and those tunnels have intercepted the ore body so that engineers can measure up carefully distances, widths, and values, and report on the tonnage. That is the only way we can tell whether we have got it or whether we haven't got it. In this case we can report concretely, and I got interested

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there in that country, hearing the reports, and from the correspondence—I got letters right along—and I got interested in the country. It was progressing satisfactorily, and I have interviewed dozens of men—engineers, citizens—and so I have a very good knowledge of Siskiyou County without ever having been in it., and I came over here, not because of my own interest, but because I think it is a national shame that these people haven't an outlet. They are cut off on the east by a selfish railway system that has kept other railroads out. They are cut off on the other side because there is no way out to sea. To have a section five times as big as the State of Massachusetts cut off in this United States and go and spend $40,000,000 in Alaska is a crime.

We ought to look after our immediate needs first, and I think it is as niggardly for the Government to refuse to give these people a harbor as it would be for a man who had an enormous estate to refuse to build a gate to it and I feel so much interested in it that I would do anything I could to help these people to live there. I haven't any interest in the matter directly, and I have lots of other things to do. I have got this two-sevenths interest in this mine, but that will work itself out anyway. I don't feel that we have to ship it this year or next year. But from the nation's standpoint it is not a valuable property. I was speaking to Mr. Hill about some mining ground. Well, he said that ore is there but as far as being of any interest to you or me, it is just as valueless as it was when Adam was a little boy. I think it is a grave duty on the part of everybody to look into the feasibility of it. The statement was made here that that railroad would be built. Dr. Reddy is the kind of a man who will bind a railroad. If you say "no" to that harbor he will have to say "die" to that railroad, because the harbor will have to come first, and it ought to come first. Those people ought to be prosperous and happy, because the rest of the country is. In New York I have talked with lumber dealers about what the effect of the Panama Canal will be. A number of ships are being built and it is just a question of getting the lumber. "It will help us a lot," they said, "because it will cut costs down." Our cost of lumber in New York is very high. I don't know why it should be so high there, but it is. They said, and it is clearly obvious, that if you can't get harbors to put your lumber on the ships, when the lumber is ready, you can't get it to the harbors in New York. And San Francisco is no shipping market, and Crescent City, with all that Government land if that harbor would be built so that they could ship it, would enable them to ship—I would say, that we will prepare to ship 500 tons of ore per day as soon as we are assured that you will prepare the harbor. It will take us a year to make arrangements to do that. Without it we will do nothing.

Col. NEWCOMER. How would you get it to the harbor?

Mr. HOLTER (or HOLTEN). We would have to build a spur line. We would build that ourselves, if we were assured of the railroad through to the harbor.

Col. NEWCOMER. In order to serve Siskiyou County in any large measure, it looks as though there would have to be a great deal of railroad construction in there.

Mr. HOLTER. This mineral section, where the ore is good and developed, I think is all tributary right there. We are 6 miles above the Klamath River, and I think that ledge runs through there and to the smelters at Tacoma or San Francisco and they say it is highly desirable.

Maj. KUTZ. The railroad between Grants Pass and Crescent City would cross Siskiyou County?

Mr. HOLTER. Everything flows into it, regardless of county lines. It would give us the outlet we want.

Ex-Senator BOURNE. Mr. Chairman and gentlemen, there is this viewpoint that occurs to me, that is worthy of consideration. From a governmental standpoint solely, with the ownership that the Government has now taken, the reservations that are referred to, 60 per cent of the lumber is ripe but worthless under existing conditions. Now taking that eighteen million or a million and a half on the part of the Government, if it makes that lumber worth $10 a thousand, now worthless, it is worth to the Government itself, on the 60 per cent of the lumber that is ripe, $150,000,000, or 1,000 per cent return on the recommended investment. If they are facts, I rely upon the Forestry Department for the figures in reference to the amount of timber, and if I had a vote in the matter I would vote for the Government to build the road on account of the Government's own interest, if I wasn't bitterly opposed to Government ownership of railroads.

Mr. HOTCHKISS. Mr. Webb, of the city of Crescent City.

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Mr. WEBB. I will make it very short. Some mention has been made in the report of Col. Rees about this subject. The city of Crescent City will be ready to furnish their subsidy as soon as the Government is ready to receive it. Also the city will take care of lands on shore, convenient for quarters, shops, yards, and space that the Government may need for operation, free of charge to the Government and at any place practically along the shore, at least a convenient, accessible place to the work. The matter of wharves can be taken care of because the city owns or controls the waterfront out to where the water is 18 feet deep, and they no doubt would build a municipal wharf. It is large enough, under the present plan, without the extra excavation mentioned under subdivision 2 of your reasons. The plans of this 2,000,000-ton output mentioned by Col. Rees are briefly set out in his letter which will be filed with you. There is no bar at Crescent City. This is the only place between Progress Point and San Francisco that you can have a harbor without a bar. It is the only place that you can have a harbor regardless of bar, with a 30-foot entrance depth. That is a point worthy of consideration, to my mind.

Col. WINSLOW. There is a little community around there at Crescent City.

Mr. WEBB. I speak of the Crescent City harbor project as surveyed by Col. Rees, along with those other places up and down the coast, varying from 9 to 18 feet in depth over their bar, some a little more, but none of them, so far as I know of, 32 feet. Now, that would take a good-sized ship. Col. Rees, on this 2,000,000-tons-annually proposition, flures that that can be handled by steamers that don't draw over 24 feet of water. This matter is also desired by some thirty odd commercial clubs and commercial centers, resolutions of which we will file as exhibits, and if it is agreeable to the board, I would like, on behalf of the delegation, to request that we be permitted to file these later this week, in a day or two. They are typewritten, but not proof-read and I would like to go over them carefully before filing the data. I thank you very much.

Mr. HOTCHKISS. I want to thank you on behalf of the delegation for the extended hearing you have given us. I was going to say something but I don't believe I will. All I want to say is that in 1854 there were more votes cast than at the presidential election of 1912. There will be less votes cast in 1954 than in 1912, in that community, unless that community gets some physical relief. I would like to say something about the logging business. Now, you can never do anything until you get it to water, on the ship. There is no use talking about sending it to San Francisco. You can't sell it there. You might sell some but not much. What we want to do is to get that lumber in there where we can have a mixed cargo. That is the one place where you can get spruce, etc. (other lumber specified), on one vessel and send it over here to New York to stock a lumber yard. The man has to have different kinds of lumber. We don't want to send any lumber from there to San Francisco and we don't want to send it to Portland. We want to send it to South America and to Australia and to the United Kingdom. The lumber in that country will never come out anywhere excepting coming straight into the sea here. Forty per cent of the lumber mills in Washington and Oregon went bankrupt in the last 24 months. If they could have had a $2 rate on stumpage, they would have kept on sawing. They are close to water in Washington at Coos Bay, and a little at Crescent City and at Eureka, where they can roll the logs into the Sound—they are still at it. But you have got to get about $2 or $2.50 before you can do much business. All this wealth will lie there——

Col. NEWCOMER. Will you explain the present situation. You have a wharf and some commerce?

Mr. HOTCHKISS. We have two vessels there. One of them laid outside of that harbor in the month of January, waiting for a chance to get in——

Col. NEWCOMER. What are the ordinary conditions during the season? Are the conditions favorable all the year?

Mr. HOTCHKISS. Some times in the summer it is all right, say, for months at a time, but we have only got 13 or 14 feet and, while the vessels are shallow vessels, the big rollers come—that is a general picture from the north and the west. The water comes in that direction. The harbor is in here. [Presented photographs[1] and prints[1] before the board and pointed out various locations, etc., on same.] We have 148 acres, a whole mile, almost as much as the frontage of San Francisco, under this improvement, as outlined. We have 148 acres. A mile frontage of 24 to 32 feet. We never have any trouble with a vessel in there. If a storm

[1] Not printed.

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comes up, we just run out. With this jetty coming up, when we
are always safe. That is the one place on the Pacific coast, excep
cisco, where it is possible to make a harbor where a ship, if she is
danger, can come in and be safe. She can run in there any time.
feet there.

Col. NEWCOMER. It seems to me it is a very difficult place to get

Mr. HOTCHKISS. There is 1,500 feet there.

Col. NEWCOMER. What proportion of time now are you dis
weather conditions?

Mr. HOTCHKISS. About 12 months in the year.

Col. NEWCOMER. I understand this, gentlemen, you run a regul
boats.

Mr. HOTCHKISS. (Col. Newcomer's previous question and imme
ing question were too rapid to admit of recording Mr. Hotchkiss

Col. NEWCOMER. What I mean is * * * with this improvem

Mr. HOTCHKISS. There are skiffs. If we would run a bigger b
be another thing. She can't lie in there. The water is too shall

Col. NEWCOMER. She don't have to come in.

Mr. HOTCHKISS. If we run out we would strike those rollers.

Col. NEWCOMER. You are supposed to bring the boats in there a

Mr. HOTCHKISS. The jetty comes in and breaks off that roller.
no sea inside then.

Col. NEWCOMER. Is there any shipping of consequence there no

Mr. HOTCHKISS. No. There is practically no shipping there no
shipping there is is rather erratic.

Col. ABBOTT. We are very much obliged to you; gentlemen.

Mr. HOTCHKISS. We thank you very much for your courteou
consideration in giving us such an extended hearing. We have b
prints and pictures along. Do you want to look at them?

Col. ABBOTT. You might leave them.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 435.

MOSQUITO CREEK, VA.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF MOSQUITO CREEK, VA.

DECEMBER 17, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 16, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, of this date, together with copy of a report from Lieut. Col. C. A. F. Flagler, Corps of Engineers, dated August 23, 1915, on preliminary examination of Mosquito Creek, Va., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 16, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Mosquito Creek, Va.

1. There is submitted herewith for transmission to Congress report dated August 23, 1915, by Lieut. Col. C. A. F. Flagler, Corps of Engineers, on preliminary examination authorized by the river and harbor act approved March 4, 1915, of Mosquito Creek, Va.

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2. This creek is a tidal estuary of the Rappahannock River, about 4 miles from its mouth. The entrance to the creek is obstructed by a bar having a depth of 2 to 4 feet at mean low water. Inside the creek a depth of 6 feet is available. The commerce along the creek is carried in small motor and sail boats, which in times of unfavorable winds and tides experience difficulty in crossing the bar. The improvement desired is a channel through the bar at the entrance of such dimensions as to permit easy access to the creek. The district officer states that the cost of dredging a channel and constructing a necessary protecting breakwater would be large, and there would probably be a very considerable expense for maintenance. In his opinion the benefits to be derived are incommensurate with the expense involved, and he therefore expresses the opinion that the locality is not worthy of improvement by the General Government. The division engineer concurs in this opinion.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated October 12, 1915, concurring in the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Mosquito Creek, Va., is not deemed advisable at the present time.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
October 12, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's report submitted under authority of the act of March 4, 1915, on preliminary examination of Mosquito Creek, Va.

2. This creek is a tidal estuary of the Rappahannock River, about 4 miles above the mouth of the latter. The entrance to the creek is obstructed by a bar over which the available depth is about 2 feet at mean low water. The mean tidal range is about 1.3 feet. Inside the creek there is an available depth of about 6 feet for some distance up both the northeast and northwest prongs.

3. The principal occupation of the residents along the banks of the creek is fishing and oystering. They use small gasoline motor boats, and at times difficulty is experienced in getting over the bar. Most of the commerce is carried by these boats to near-by wharves on the Rappahannock River where the Baltimore steamers touch. The amount of commerce is not given. The improvement desired is a channel 60 feet wide and 6 feet deep across the bar. The district officer states that such a channel would require the protection of a stone or concrete dike. He believes that without protection the

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channel might be obliterated by one storm; that it would be expensive to construct and maintain, and that, while it would be of local benefit, it would be practically of no value to general commerce. He therefore reports the locality as unworthy of improvement by the General Government. The division engineer concurs with the district officer.

4. Interested parties were informed of the unfavorable report of the district officer and given an opportunity of submitting statements or arguments to the board, but no communications on the subject have been received.

5. The district officer was unable to ascertain the amount of commerce on the creek, but it is apparently not extensive. There are no large centers of industry adjacent to create a commerce of magnitude. The improvement desired is at an exposed locality, and it appears that it would be unduly expensive, both in construction and maintenance. In view of these conditions, the board concurs with the district officer and the division engineer in the opinion that it is not advisable for the United States to undertake the improvement of Mosquito Creek, Va.

6. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other related subjects which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

For the board.

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

PRELIMINARY EXAMINATION OF MOSQUITO CREEK, VA.

UNITED STATES ENGINEER OFFICE,
Washington, D. C., August 23, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Preliminary examination of Mosquito Creek, Va.

1. In compliance with provisions of letter from the Chief of Engineers, dated March 30, 1915, the following report on the preliminary examination of Mosquito Creek, Va., required under the act of Congress approved March 4, 1915, is submitted.

2. Mosquito Creek is a tidal estuary of the Rappahannock River lying wholly within Lancaster County, Va., about 4 miles above the mouth of the Rappahannock River and 103 miles below Fredericksburg, Va. The mouth of the creek is obstructed by a bar extending from Mosquito Point to Mosquito Island. The distance across the bar between the 6-foot contour inside of the creek and the 6-foot contour in the Rappahannock River is about 600 yards, and 400 yards of this distance has a depth of 2 to 4 feet at mean low water. Inside of the creek 6-foot depths are available almost to the extremity of the northwest prong and within one-half mile of Palmers to the northeast.

3. The preliminary examination was made on June 25, when a public hearing, attended by 26 persons, was held at White Stone

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Wharf. Interested parties stated that present commerce was carried on small gasoline boats or on small sail boats of 10 tons burden or less; that the inhabitants along the shores of Mosquito Creek were dependent entirely upon their small boats to get their products to the market and to bring building materials, merchandise, etc., into the creek. On the shores of the creek there exists one store and a marine railway at the upper end of the northwest prong; one store and one oyster-shucking house at Palmers. The marine railway was said to be able to handle boats up to 20 tons burden. The stores are engaged in a general merchandise and agricultural implement business. The oyster-shucking house claimed to handle about 25,000 tons of unshucked oysters annually. The oysters were shucked in the house and shipped by the Rappahannock River steamers to Baltimore. Oysters were carried to the Rappahannock River steamboat wharves, Whitestone or Westland, by small gasoline boats. A small wharf, privately owned, is at Palmers. Its use is restricted to serving the oyster-shucking house. No exact figures of the amount of commerce affected were given. A statement was promised, but to date it has not been received. On the date of the public hearing the district officer and the assistant engineer took a trip over the highway between White Stone Wharf and Palmers. The trip was made in a motor car furnished by a local party attending the public hearing. The road was found to be made of dirt, tolerably well drained, and in fair condition. The run was made in 15 minutes. The distance traversed was 4¼ miles. A daily boat to and from Baltimore, Md., makes landings at Westland and White Stone Wharves, which are, respectively, 3½ and 2½ miles by water from Mosquito Point. The nearest railroad is at West Point, Va., about 36 miles away. There is no record of any previous preliminary examination of Mosquito Creek, Va. There are no water power or other kindred features to share the cost of the proposed improvement. No local cooperation in sharing the cost of the proposed improvement has been offered.

4. The shores adjoining the creek are populated by oystermen and fishermen. In their work they use small gasoline or sail boats and at times of unfavorable winds and tides experience great difficulty in crossing the bar. Under very unfavorable conditions of winds and tides the bar at the entrance of the creek ebbs entirely bare.

5. The improvement desired is a channel through the bar at the entrance to the creek of such dimensions as to permit easy access to and from the creek for the small gasoline and sail boats which harbor in the creek. Suggestion was made that the channel run southwest from the end of Mosquito Point or, if found more economical, southeast therefrom toward Sturgeon Creek Shoal Light. A channel 60 feet wide and 6 feet deep across the bar at the entrance to the creek was asked for. The channel would undoubtedly require the protection of a stone or concrete dike. It is believed that without this protection the shifting sands would fill the channel and probably obliterate it in one storm.

6. The improvement desired would doubtless be of benefit to the locality, but its value to general commerce is practically nil. The cost of dredging a channel would be large, the construction of a protecting breakwater would probably be still greater, and there would doubtless be a very considerable expense for maintenance. The

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benefits to accrue are not commensurate with the expense involved and, in my opinion, the locality is not worthy of improvement by the General Government.

7. A sketch map [1] of Mosquito Creek, together with a vicinity sketch,[1] accompanies this report. The creek and locality are also shown on United States Coast and Geodetic Survey Chart No. 534 in latitude N. 37° 36′ and longitude W. 76° 21′.

8. A list of persons to whom unfavorable notice was sent is herewith.[1]

C. A. F. FLAGLER,
Lieut. Col., Corps of Engineers.

[First indorsement.]

OFFICE OF DIVISION ENGINEER,
EASTERN DIVISION,
New York City, September 11, 1915.

To the CHIEF OF ENGINEERS.

Concurring in the views of the district engineer officer.

W. M. BLACK,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

[1] Not printed.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 436.

MOUTH OF BLACK RIVER, MICH.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON REEXAMINATION OF MOUTH OF BLACK RIVER, MICH.

DECEMBER 17, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 16, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, of this date, together with copy of a report from Lieut. Col. Mason M. Patrick, Corps of Engineers, dated August 2, 1915, with map, on reexamination of mouth of Black River, Mich., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 16, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Reexamination of mouth of Black River, Mich.

1. Under authority contained in section 14 of the river and harbor act approved March 4, 1915, there is submitted herewith for transmission to Congress report dated August 2, 1915, with map, by Lieut. Col. Mason M. Patrick, Corps of Engineers, relative to the project for improvement of the mouth of Black River, Mich.

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2. The Black River enters St. Clair River within the limits of the city of Port Huron. In the St. Clair River near the mouth of the Black River there formerly existed an extensive bar or shoal on the American side. Under the present project for improvement of the locality this shoal was removed to a depth of 16 feet at low water, and in addition the outer side of the middle ground adjacent to the main channel of the St. Clair River was deepened to 18 feet, the project being completed in 1892. This work was undertaken in the days when sailing vessels were numerous. The current at the head of St. Clair River is quite rapid, and such vessels frequently found it difficult to navigate this part of the river. The project was designed to give a depth over the entire middle ground which would be adequate to permit any vessels which then navigated the lakes to pass over it. The depth now available is ample for all local traffic, and owing to the size of vessels engaged in through transportation, no advantage would be gained with any depth less than 21 feet, and it is not deemed advisable to excavate to this extent, as it would tend to lower the lake levels above. There appears to be no necessity for any further work at this locality, and the district officer recommends that the project be abandoned. The division engineer concurs in this recommendation, with the understanding that such dredging as may be necessary to preserve the project depth of 16 feet at low water near and in the mouth of Black River can and will be done under the project for the improvement of that river. The Board of Engineers for Rivers and Harbors concurs in the views of the division engineer.

3. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore recommend that legislation be enacted authorizing the abandonment of the project for mouth of Black River, Mich., as a separate improvement, and that in the next appropriation for Black River at Port Huron, the project be defined as including necessary dredging to maintain the project depth to deep water in St. Clair River.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 15, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. This report on mouth of Black River, Mich., is submitted under authority of that portion of section 14 of the act of March 4, 1915, which reads, "and the Chief of Engineers is directed to make a report upon any other projects, river or harbor, the further improvement of which under present conditions is undesirable or in which modifications of the plans or projects should be made."

2. The present project, adopted in 1888, contemplates dredging to a uniform depth of 16 feet along the dock front of Port Huron from the 16-foot curve above to the same curve below the mouth of the river, at an estimated cost of $69,300. The project was completed

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in 1892, including increasing the depth on the outer border of the shoal to 18 feet.

3. The district officer states that this work was undertaken years ago when sailing vessels were numerous, and difficulty was encountered here at times owing to the rapid current and the sharp curve in the channel. The depth now available is ample for all local traffic, and owing to the size of the vessels engaged in through transportation, no advantage would be gained with any depth less than 21 feet, and it is not advisable to excavate to this extent, as it would tend to lower the lake levels above. Moreover, the necessity of further work is not apparent.

4. In view of these conditions, the district officer recommends that the project be abandoned, and the division engineer concurs with the understanding that such dredging as may be necessary to preserve the project depth of 16 feet at low water near and in the mouth of Black River can and will be done under the project for the improvement of that river.

5. It appears from the information now available that further work under the project for "Mouth of Black River" is neither necessary nor advisable, unless a strict interpretation of the project for "Black River" will prevent dredging in the St. Clair through the shore bar into the mouth of Black River. Any question of doubt could, however, be cleared away by including the necessary work at the mouth in future appropriations for Black River. It is therefore recommended that legislation be enacted authorizing the abandonment of the project for mouth of Black River, Mich., as a separate improvement, and, further, that in the next appropriation for Black River the project be defined as including necessary dredging to maintain its project depth to deep water in St. Clair River.

For the board:

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

REEXAMINATION OF MOUTH OF BLACK RIVER, MICH.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Detroit, Mich., August 2, 1915.

From: The District Engineer Officer.
To: Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Modification or abandonment of project, Mouth of Black River, Mich.

1. In compliance with the directions contained in the fourth indorsement, office Chief of Engineers, May 3, 1915, the following report is submitted upon the advisability of modifying or abandoning the present project for improving mouth of Black River, Mich.:

2. The Black River enters St. Clair River within the limits of the city of Port Huron about 2¼ miles below the head of the latter river. The locality is shown on Lake Survey Chart No. 3.

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Reference to previous examination or survey reports.

Congressional documents.				Annual reports of Chief of Engineers.	
House or Senate.	No.	Congress.	Session.	Year.	Page.
				[1] 1871 [2] 1887	177–180 2279–2280

[1] No maps. [2] Basis of project adopted by Congress—contains no maps.

3. In the St. Clair River, near where the Black River enters, there existed an extensive bar or shoal on the American side which obstructed the approach to Port Huron docks and also formed a "middle ground" nearly 50 acres in extent which crowded the main channel in a sharp curve toward the Canadian shore. The original project submitted in 1871 contemplated the removal of this bar and middle ground to a depth of 15 feet. The work was begun in 1872 and completed in 1878 at a cost of $56,500. This depth of 15 feet proved to be inadequate. The present project, regarded as adopted by the river and harbor act of August 11, 1888, pursuant to the before-mentioned report of preliminary examination and survey in the annual report of 1887, which provided for "simply to remove, by dredging, all the material above the uniform depth of 17 feet," was carried out by dredging over the bar and middle ground to a uniform depth of 16 feet at low water, 2 feet below mean lake stage 1860–1875. Work was begun in May, 1889, and completed in 1892 and in addition, by authority, the outer side of the middle ground adjacent to the main channel of the St. Clair River was deepened to 18 feet. Since 1892 maintenance dredging has been done at a cost of $12,008.31. All funds appropriated for this work have been expended.

4. The projects above mentioned were adopted in the days when sailing vessels were numerous on these waters and when the vessel draft was much less than is common at present. The current near the head of the St. Clair River is quite rapid, probably not less than 5 miles per hour, and a sailing vessel, or vessel with little power, frequently found it troublesome to navigate this part of the river, and there were a number of cases where vessels were swept onto the middle ground by the current or by adverse winds. Such accidents were not uncommon when a number of vessels were driven back by storms on Lake Huron or were prevented from entering the lake on account of such storms. The projects provided for giving a depth over the entire middle ground which would be adequate to permit any vessel which then navigated the lakes to pass over it.

5. The fluctuation of the water surface of the St. Clair River is due to the seasonal fluctuation of all waters in the lake system and amounts to about 1.5 feet a year. The strong current in the river makes navigation at this locality more difficult than elsewhere in this stream.

6. All commerce between points above and below Port Huron passes through this portion of the St. Clair River and the volume of such commerce is great. While no statistics have been kept of commerce in this particular part of the stream, it is probable that it

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differs but little from that which has been given for the St. Clair Flats Canal, and during the year 1913 the commerce at the latter locality was estimated to be 78,000,000 tons, valued at $856,000,000. There was some decrease in this commerce during the year 1914, but it seems reasonable to assume that in the future it may be even greater than in 1913.

7. The changes which have taken place in freight vessels on these waters, their increase in size and the practical disappearance of sailing freighters, have lessened the importance to through commerce of the maintenance of the project depth over this middle ground, nor is any depth greater than that which now exists necessary for the local traffic on the Black River, in which the project depth is 16 feet at low water. Furthermore, studies which have been made subsequent to the adoption of the present project show quite clearly that any decided increase in the area of cross section of the St. Clair River at this locality will bring about a decrease in the levels of the lake waters above. The only way in which through traffic would benefit by further work in this locality would be by removing the entire middle ground to a depth sufficient to permit the deepest draft lake freighter to pass over it or, in other words, to give on this shoal a navigable depth of at least 21 feet. To modify the project by providing for the removal of such a considerable amount of material is not advisable. As a matter of fact, it is so important to do nothing to bring about a material lowering of the lake levels that it is my opinion the project for the improvement at the mouth of the Black River should be definitely abandoned. This recommendation is merely a repetition of those which have been submitted in the annual reports of this office for the last few years.

8. No question of the development of water power enters into the improvement at this locality, nor are there any questions relating to terminals or terminal facilities.

MASON M. PATRICK,
Lieut. Col., Corps of Engineers.

[First indorsement.]

OFFICE DIVISION ENGINEER, LAKES DIVISION,
Buffalo, N. Y., August 17, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. Forwarded.

2. Referring to the map of the locality accompanying the district officer's report, it is understood that in so far as maintenance dredging may be required in future to preserve the project depth of 16 feet at low water near and in the mouth of Black River, such dredging can and will be done under the present project for "Improvement of Black River at Port Huron, Mich."

3. The last maintenance dredging was done in 1907 at a cost of $3,783.74, and, as shown on the district officer's map, the present depth is adequate for access to Black River, except at its mouth, where 13.7 feet at low water is shown.

4. In annual report, Chief of Engineers, 1914 (p. 3041), the district officer recommends "* * * that no further dredging in this locality be permitted by private parties, except that necessary to improve

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the approach to docks actually in use, and for that purpose only * * *."

5. The recommendation of the district officer in paragraph 7 of his report is concurred in, subject to the conditions stated in paragraphs 2 and 4 above.

J. G. WARREN,
Colonel, Corps of Engineers,
Division Engineer.

[For report of the Board of Engineers for Rivers and Harbors see p. 2.]

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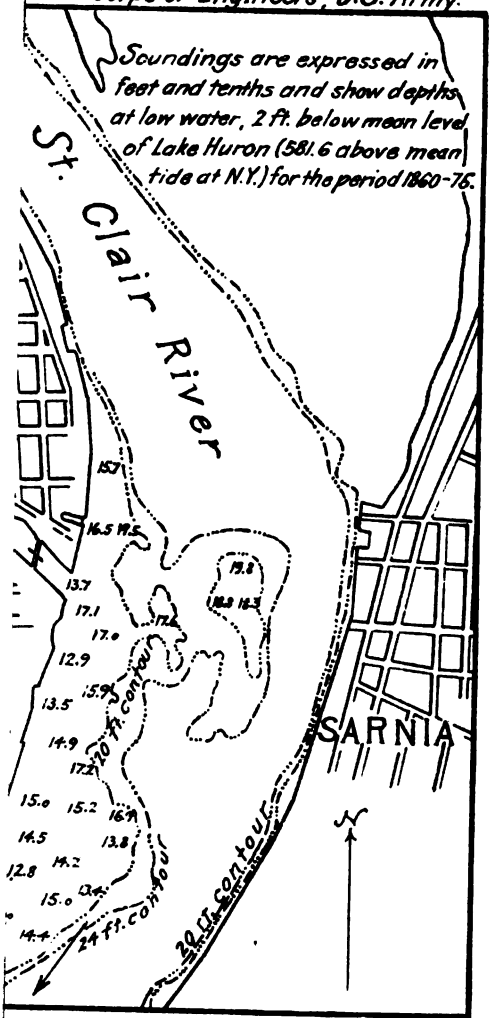
Corps of Engineers, U.S. Army.


Soundings are expressed in feet and tenths and show depths at low water, 2 ft. below mean level of Lake Huron (581.6 above mean tide at N.Y.) for the period 1860-76.
St. Clair River
SARNIA
20 ft. contour
24 ft. contour
30 ft. contour

Improvement of
TH OF BLACK RIVER,
MICHIGAN.

Scale in feet.

590 0 1000 2000 FT

...npany my report dated August 2, 1915.

...son M. Patrick
Colonel, Corps of Engineers, U.S. Army.

...use Doc. No. 436 ; 64th Cong., 1st Sess.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 437.

ISLE AU HAUT HARBOR, ME.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF ISLE AU HAUT HARBOR, ME.

DECEMBER 17, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 16, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, of this date, together with copy of a report from Maj. F. A. Pope, Corps of Engineers, dated August 18, 1915, with map, on preliminary examination of Isle au Haut Harbor, Me., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 16, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Isle au Haut Harbor, Me.

1. There is submitted herewith, for transmission to Congress, report dated August 18, 1915, with map, by Maj. F. A. Pope, Corps of Engineers, on preliminary examination authorized by the river and harbor act approved March 4, 1915, of Isle au Haut Harbor, Me.

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2. Isle of Haut is an island at the southeastern entrance to Penobscot Bay. The village of Isle au Haut is situated on the northwest side of the island opposite Kimballs Island, the passage between the two islands being known as Isle au Haut Thoroughfare, which is the harbor for the village. This passage is about 1½ miles in length and from 400 to 1,500 feet wide. It has ample depth, except near the upper end, where it is obstructed by a bar extending entirely across, and having a depth of only 1 foot at low tide. The mean tidal range is about 9.6 feet. The improvements particularly desired are the dredging of a channel through this bar, and the removal of some projecting rocks near the steamboat wharf at Point Lookout, which is about 1 mile from the town of Isle au Haut. This town has a permanent population of about 100, and a summer population of about 900. The principal business of the community is fishing and providing for the summer inhabitants. The district officer reports that the commerce is small and there is no prospect of an increase even if the desired channel were provided. To remove the rocks near the wharf at Point Lookout would simply make the landing more convenient, and a small extension of the wharf would accomplish the same result. The district officer is therefore of opinion that the locality is not worthy of improvement by the General Government. The division engineer concurs in this opinion.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated October 12, 1915, concurring in the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors and therefore report that the improvement by the United States of Isle au Haut Harbor, Me., is not deemed advisable at the present time.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
October 12, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's report, submitted under authority of the act of March 4, 1915, on preliminary examination of Isle au Haut Harbor, Me.

2. This locality is about 24 miles easterly from Rockland, Me. A passage between Isle au Haut and Kimballs Island is known as Isle au Haut Thoroughfare, and on it is the harbor of Isle au Haut. A village with the same name is situated on Isle au Haut. There is ample depth in this waterway, except at the northern entrance, where a bar practically dry at low water extends across it. The mean range of tide is about 9.6 feet. The improvement desired is a dredged channel through the bar and the removal of some rocks claimed to interfere with navigation.

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3. The permanent population adjacent is about 100, and there has been no increase in recent years. The principal industries are fishing and catering to the needs of summer residents, numbering about 900. The commerce is therefore quite small. The district officer states that the inconvenience caused by the rocks most complained of would be overcome by a short extension of the pier. In the immediate vicinity of the harbor proper the depth is ample and the shelter adequate for such vessels as are likely to make use of this harbor. The dredged channel through the bar would be a convenience and not a necessity, as it would merely save the short distance around Kimballs Island. The district officer reports the locality as unworthy of of improvement and the division engineer concurs.

4. Interested parties have been informed of the unfavorable report of the district officer and given an opportunity of submitting statements and arguments to the board, but no communications on the subject have been received.

5. The improvement contemplated would affect only a small commerce, which is accommodated under present conditions with slight inconvenience. The resulting benefits would not be of sufficient magnitude to warrant the probable cost of the work. Two unfavorable reports covering this locality are now before Congress, and there has been no material change in conditions since they were submitted. In view of these facts, the board concurs with the district officer and the division engineer in the opinion that it is not advisable for the United States to undertake the improvement of Isle au Haut Harbor, Me.

6. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other related subject which could be coordinated with the suggested improvement in such manner as to render the work advisable in the interests of commerce and navigation.

For the board:

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

PRELIMINARY EXAMINATION OF ISLE AU HAUT HARBOR, ME.

UNITED STATES ENGINEER OFFICE,
Portland, Me., August 18, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Preliminary examination of Isle au Haut Harbor, Me.

1. The river and harbor act of March 4, 1915, directs a preliminary examination of Isle au Haut Harbor, Me.

2. Isle au Haut Me., is an island at the southeastern entrance to Penobscot Bay, Me., and about 85 miles northeast of Portland, Me. The village of Isle au Haut is situated on the northwest side of the island opposite Kimballs Island. Between Isle au Haut and Kimballs Island is a passage called Isle au Haut Thoroughfare, which is the harbor for the village and is what is referred to in the act as Isle au Haut Harbor.

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3. The Thoroughfare is about 1½ miles in length and from 400 to 1,500 feet wide. It has ample depth, except near the upper end, where it is obstructed by a bar extending entirely across it. Across the bar from 12 foot contour to 12 foot contour the distance is about 1,700 feet. This bar is bare at low tide except for a narrow, winding channel about 1 foot deep. The mean range of tides is about 9.6 feet. There are some projecting rocks about 25 feet from the steamboat wharf which interfere with the landing of boats at Point Lookout, which is at the northern entrance to the Thoroughfare. It is also reported by residents of the island that there are some projecting rocks which are a menace to navigation, between Flake Island and Birch Point, between the mouth of Barters Creek and Burnt Island, and between Burnt Island and Isle au Haut, about 1,200 feet northeast of the mouth of Barters Creek. The locations of these rocks I have been unable to determine with the facilities available for a reconnaissance. The steamboat company which runs boats from Point Lookout through the channel between Burnt Island and Isle au Haut complains only of the rocks next to the steamboat wharf. For an understanding of the reference to these localities attention is invited to the accompanying map.

4. The locality is shown on Coast Survey Chart No. 309. A map[1] of the harbor with its approaches, enlarged from the Coast Survey chart, with borings indicated thereon made for this preliminary examination, is submitted herewith. The borings shown are approximate only in their location, but are of sufficient accuracy for the purpose of this report.

5. The population of the town of Isle au Haut, which consists of Isle au Haut and several small adjacent islands, is given in the census for 1910 as 106 and has not increased materially since. The summer population is about 900. The principal business of the community is fishing and providing for the summer inhabitants.

6. The nearest railroad point is Rockland, Me., about 24 miles to the westward across the mouth of Penobscot Bay. Transportation is furnished by the Vinal Haven & Rockland Steamboat Co., whose boats make a round trip from Rockland to Swans Island via Isle au Haut 6 days in the week for about 6 months in the year, and 3 trips per week during the fall, winter, and spring. Mail is carried by a small boat to Stonington, there being two mails per day each way in summer and less frequent service in winter.

7. The steamboat company claims that its business amounts to about $2,400 per year, of which about two-thirds is received from passenger and about one-third from freight traffic. Besides this there is considerable traffic by private boats, both passenger and freight. The extent of this traffic can not be determined. I have been unable to obtain any further commercial statistics for the harbor.

8. Two preliminary examinations have previously been made of this locality—

First. A preliminary examination of "Isle au Haut Thoroughfare, between the island of Isle au Haut and Kimballs Island, with a view to obtaining a channel 12 feet deep and 30 feet wide," was made in 1902, report of which is published in House Document No. 224, Fifty-eighth Congress, second session. Conditions at that time

[1] Only the vicinity sketch is printed.

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were about as they are now. The permanent population was somewhat larger and the summer population considerably smaller than at present. The report upon this examination was unfavorable on the grounds that the only object which such an improvement could serve would be to meet the prospective demand for traffic through the bar; that so long as the present harbor is sufficiently large to accommodate fishermen seeking refuge there the requirements of the situation seemed to be met with the condition of the harbor as it then was and there was no other present or prospective traffic through the Thoroughfare worthy of consideration in connection with the desired improvement.

Second. A preliminary examination of "Isle au Haut Thoroughfare, between the island of Isle au Haut and Kimballs Island, with a view to obtaining a channel of increased depth and width and the establishment of a harbor of refuge," was made in 1909, report of which is contained in House Document No. 486, Sixty-first Congress, second session. The physical conditions of the harbor at that time were practically the same as they were at the time of the previous preliminary examination and as they are at the present time. The permanent population had somewhat decreased to about what it is at the present time. The summer population had increased. The improvements desired were about the same as at the previous preliminary examination. The report was unfavorable on the ground that the extent of the interests involved and the benefits to be derived from the desired improvement in proportion to the probable cost were such as to make the locality unworthy of improvement by the General Government.

9. There are ample wharf facilities for the present or prospective needs of commerce. There are two wharves opposite the village, one a short distance above the village and one at Point Lookout. Passengers and freight are usually landed at the latter wharf, which, while private, is available for public use within reasonable limits.

10. I made a visit to the locality on June 23, 1915, and had a conference with parties interested and personally examined the harbor and approaches. Borings made at the time of this visit indicate that the bar is composed of soft mud underlaid with hard earth from 8 to 12 feet below mean low tide. The part of the Thoroughfare north of the bar is exposed to northwesterly gales and is not a safe harbor at all times. The part opposite the village is well sheltered and is used by the community as an anchorage, and, together with the more southerly part of the Thoroughfare, is used by passing vessels as a harbor of refuge. The southerly entrance is marked by a lighthouse. The bar is impassable to vessels, except small ones, and then only near high tide. This results in a certain amount of inconvenience. Regular boats touch at Isle au Haut on the way between Stonington and Swans Island. They land, as before stated, at a private wharf at Point Lookout, about 1 mile above the village, because it would be about 6 miles longer to go around Kimballs Island to the village. This necessitates the transfer of all passengers and baggage for the village by small boat or team. The nearest market to Isle au Haut is Stonington, about 6 miles to the north in a direct line. To reach this point from the village vessels must go out around to the south of Kimballs Island. In southerly storms it is sometimes dangerous to attempt to round the southerly point of

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Kimballs Island. This results in delay until the storm subsides. Vessels anchored in the southern part of the Thoroughfare for refuge from storms could sometimes pass out through the northern end and proceed on their way when it is too stormy to go south if they were not prevented by the bar. Vessels north of Isle au Haut and seeking refuge from northern storms can not reach the lower part of the Thoroughfare for shelter on account of the bar. In order to decrease or remove all these difficulties and inconveniences it is desired by those interested that a channel be dredged through the bar. It is also desired that the rocks which are claimed to be near the route of vessels going from Point Lookout through Burnt Island Harbor and the rocks near the wharf be removed.

11. The bar appears to be mostly of soft material, although it is quite possible that some ledge might be discovered. The steamboat company complains only of the rocks near the wharf and not those near the line of vessels on the regular run. To remove the rocks near the wharf would simply make the landing more convenient. It would seem that the simplest way to do would be to extend the wharf a few feet farther. To remove the bar would reduce slightly the distance to the village from the mainland and make it possible for boats to include both the village and Point Lookout in their trips and it would also increase somewhat the value of the harbor as a harbor of refuge. The harbor is large enough now to accommodate any vessels that would be apt to care to use it, and there is no prospect of an increase in traffic, even if the improvement were made. No less improvement than the dredging of a channel through the bar would, in my opinion, be of any value to the harbor, and the advantages to be gained by such improvement would not, in my opinion justify the cost thereof.

12. It is therefore my opinion that the locality is not worthy of improvement by the General Government.

13. There are no water-power developments to be considered in connection with any proposed improvement of the harbor and no land reclamation or other opportunities for lessening the cost of improvement to the Government or for securing other compensating advantages.

F. A. POPE,
Major, Corps of Engineers.

[First indorsement.]

THE DIVISION ENGINEER, NORTHEAST DIVISION,
New York City, September 1, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. Forwarded.

2. This report was prepared before the receipt of General Orders No. 9, Office of the Chief of Engineers, dated August 12, 1915. It appears to comply with all the requirements of that order with the following exceptions:

(*a*) There is a reference to previous preliminary examination reports which were unfavorable, but no reference to any work done by the United States. I understand no construction work has been done.

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(*b*) There is no statement as to bridges, but the map would indicate that there are none.

(*c*) While the number of wharves (two) is stated, the available frontages are not given. One of these wharves is a public wharf, while the other is a private wharf, but "is available for public use within reasonable limits."

(*d*) The unoccupied space available for terminals is not stated.

(*e*) The map contains no wind chart, but the report being unfavorable, this omission, I think, can be passed over.

(*f*) While a list of the parties to whom notice of unfavorable report was sent is given, no copy of the notice itself accompanies the report.

3. In the views and recommendation of the district officer I concur.

FREDERIC V. ABBOT,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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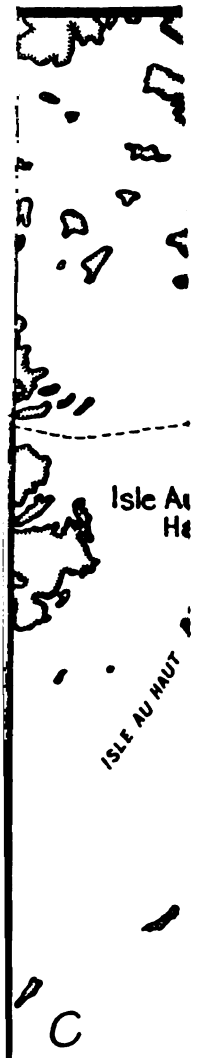

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 438.

OGEECHEE RIVER, GA.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF OGEECHEE RIVER, GA., WITH A VIEW TO ITS IMPROVEMENT IN CONNECTION WITH THE INLAND WATERWAY FROM SAVANNAH, GA., AND FERNANDINA, FLA.

DECEMBER 17, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 16, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated October 20, 1915, together with copy of a report from Col. W. C. Langfitt, Corps of Engineers, dated July 26, 1915, on preliminary examination of Ogeechee River, Ga., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

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WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, October 20, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Ogeechee River, Ga.

1. There is submitted herewith for transmission to Congress report dated July 26, 1915, by Col. W. C. Langfitt, Corps of Engineers, on preliminary examination authorized by the river and harbor act approved March 4, 1915, of Ogeechee River, Ga., with a view to its improvement in connection with the inland waterway from Savannah, Ga., and Fernandina, Fla.

2. The Ogeechee River lies entirely in the State of Georgia and has a length of about 300 miles from its source near Union Point to its mouth in Ossabaw Sound. The inside waterway from Savannah to Fernandina crosses the river about 2 miles above its mouth. The stream flows generally through a heavily timbered country, and is badly obstructed by snags, fallen trees, etc. The commerce is confined to the lower section, where there is a very good channel. It consists principally of timber brought down from the Cannouchee River. There appears to be but little demand for any improvement of the river, the interest in the matter apparently being confined to a few owners of standing timber along the Ogeechee. In view of the probable large cost of any adequate improvement and the probable small commerce that would be developed, the district officer, who is also the division engineer, expresses the opinion that the Ogeechee River is not worthy of improvement by the General Government at the present time.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated September 15, 1915, concurring in the views of the district officer.

4. After due consideration of the above-mentioned reports I concur in the views of the district officer and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Ogeechee River, Ga., with a view to its improvement in connection with the inland waterway from Savannah, Ga., and Fernandina, Fla., is not deemed advisable at the present time.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Second indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 15, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. The following is in review of the district officer's report on preliminary examination of Ogeechee River, Ga., with a view to its improvement in connection with the inland waterway from Savannah, Ga., and Fernandina, Fla., called for by the act of March 4, 1915.

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2. This stream lies wholly within the State of Georgia. It empties into the Atlantic Ocean through Ossabaw Sound. The line of the inland waterway from Savannah to Fernandina crosses the river about 2 miles above its mouth. The river flows generally through a heavily timbered country, and the channel is badly obstructed by snags and fallen trees. A large number of obstructive trestle bridges cross the river.

3. The only commerce is on the lower part of the river, where there is now a very good channel. This commerce consists principally of a few rafts brought down from the Cannouchee River, which enters the Ogeechee about 30 miles above the mouth of the latter. The tributary country is sparsely settled and the district officer, who is also the division engineer, states that little interest has been shown regarding the improvement and that there is no indication that it would be used to an extent that would justify the cost. He therefore expresses the opinion that the stream is not worthy of improvement.

4. Interested parties were informed of the district officer's unfavorable report and given an opportunity of submitting statements and arguments to the board, but no communications on the subject have been received.

5. There is little commerce on the river at the present time, and except for a moderate amount of timber, there is little in prospect. The banks are generally low and subject to overflow. There is no apparent demand or need for improvement commensurate with its probable cost. The board therefore concurs with the district officer and reports that in its opinion it is not advisable at this time for the United States to undertake the improvement of Ogeechee River, Ga.

6. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other related subjects having any material bearing upon the improvement of navigation at this locality.

For the board:

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

PRELIMINARY EXAMINATION OF OGEECHEE RIVER, GA.

UNITED STATES ENGINEER OFFICE,
Savannah, Ga., July 26, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army.
Subject: Preliminiary examination of Ogeechee River, Ga.

1. *Authorization.*—The river and harbor act of March 4, 1915, provided for a preliminary examination of Ogeechee River, Ga., with a view to its improvement in connection with the inland waterway from Savannah, Ga., and Fernandina, Fla. This duty was assigned to this office by letter from the office of the Chief of Engineers, dated March 15, 1915. The examination was made by Maj. W. P. Stokey, Corps of Engineers, my assistant, and the following report thereon has been prepared largely by him:

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2. *Location.*—The Ogeechee River lies entirely within the State of Georgia, and has a length of about 300 miles. It rises near Union Point, about midway between Atlanta and Augusta, and flows to the southeastward, emptying into the Atlantic Ocean through Ossabaw Sound. (See vicinity map inclosed.)[1]

3. *Watershed.*—Its watershed lies between that of the Savannah River and that of the Altamaha River, and has an area of about 4,700 square miles, of which 1,620 square miles are above Millen.

4. *Rainfall.*—The mean annual rainfall at Millen, which is located near the center of the watershed, is 44.48 inches. This is distributed through the year as follows:

	Inches.		Inches.
December	3.24	June	5.34
January	2.91	July	5.82
February	4.74	August	4.97
Monthly mean for winter	3.63	Monthly mean for summer	5.38
March	3.69	September	3.64
April	2.51	October	2.54
May	3.11	November	1.97
Monthly mean for spring	3.10	Monthly mean for autumn	2.72

5. *General description.*—From as far up as Louisville (mileage 196) to the sea, the river flows through a low swamp, which it overflows during freshets. The banks are generally not over 3 feet in height, and are little subject to erosion and caving. The current is quite sluggish and the general depth is very good. The width is about 50 feet at Louisville (mileage 196), 70 to 100 feet at Midville (mileage 171), 80 to 130 feet at Meldrim (mileage 51), and probably 500 feet and over on the lower 30 miles, the latter part being a tidal estuary. On the upper alluvial part of the river there are a number of incipient cut-offs. At some places the river divides into two or more branches, none of which have sufficient size to be used for navigation without improvement.

6. *Slope.*—The average surface slope from the mouth to Meldrim (mileage 51) is about 0.46 foot per mile; from Meldrim to Dover (mileage 115) it is about 1.22 feet per mile; and from Dover to Wadley (mileage 181) it is about 1.45 feet per mile. These slopes were determined from elevations at the railroad bridges furnished by the railroad companies, using the estimated lengths of the sections of river between the bridges.

7. *Freshets.*—The river is subject to freshets, which may occur at any period of the year. It is reported that at the Midville Bridge freshets reach a height of 14 feet above extreme low water, and at the Meldrim Bridge they reach a height of 13 feet.

8. *Obstructions.*—The river is badly obstructed by snags and fallen trees, as the banks are generally heavily timbered and there has been no improvement work done for many years. On the lower part of the river there are few snags in sight, but the bights near the bank are said to be filled with sunken snags and logs; some distance out an open channel is found.

[1] Not printed.

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9. *Bridges.*—Below the entrance to the Ogeechee Canal there are three bridges, which are, in order from the mouth:

Seaboard Air Line Railroad bridge, with a clear draw span of 42 feet and a clear height of 9.3 feet at mean low water, mean tidal range 1.7 feet.

Atlantic Coast Line Railroad bridge, with a clear draw span of 32 feet. (A permit has been issued to replace this with one of 60 feet clear draw span, with a clear height of 10 feet above mean low water.)

Chatham County highway bridge at Kings Ferry, near Ways Station, with a clear draw span of 30 feet.

From the entrance to the Ogeechee Canal to Louisville there are about 17 trestle bridges, with bents averaging about 11 feet in the clear and generally with little if any clearance at high water.

10. *Previous improvement.*—This river has never been improved by the United States, but some improvement was carried on at various times by the State of Georgia from about 1786 until about the time of the Civil War.

11. *Approaches.*—The river, about 2 miles from its mouth, connects with the inland water route between Savannah, Ga., and Fernandina, Fla., which has a controlling depth of 7 feet to Savannah. In the lower portion, the river itself forms about 3 miles of this route.

12. *Previous examinations.*—There have been two previous examinations of this river, the reports in both being unfavorable. The first examination was made in accordance with a provision of the river and harbor act of March 3, 1909, and included the Cannouchee River. In his report on this examination (H. Doc. No. 681, 61st Cong., 2d sess.) the district officer stated:

The railroad rates appear to be from about 5 to 7 cents per ton-mile. If the river and canal were available for this shipment, so that flatboats, towed by small power launches, could be conveniently used, a very considerable saving could be effected to these producers. I have no record of the return freight, but it must consist of commercial fertilizers, groceries, agricultural implements, etc.

This seems to be a case in which combined action by the United States and the State of Georgia is indicated. I would respectfully recommend, if the State of Georgia will recover this canal and restore it to a good working condition, give it a depth of not less than 4 feet and locks of the same size as those originally built, and operate it free of tolls, then the United States should undertake the improvement of the Ogeechee and Cannouchee Rivers by the removal of snags, leaning trees, and similar obstructions, and by such channel regulation as may be practicable. Until the intention of the State in regard to this is known, I see no occasion for making a survey of the river..

The Board of Engineers for Rivers and Harbors, in acting upon this report, expressed the following opinion, which was concurred in by the Chief of Engineers:

The improvement proposed on these rivers would be of little or no value unless the canal were available for navigation, and even if the State undertakes to reconstruct the canal it does not seem probable that it will be ready for use for several years at least.

In view of all the circumstances, the board reports that in its opinion these rivers are not worthy of improvement by the General Government at the present time.

An examination called for by the river and harbor act of June 25, 1910, was confined to a large extent to a consideration of the Ogeechee Canal, the river itself having been thoroughly examined the preceding year. In acting upon the report of this examination (H.

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Doc. No. 1116, 62d Cong., 3d sess.), the Board of Engineers for Rivers and Harbors stated:

> The canal is now in an abandoned and useless condition. A great deal of work would be necessary to make it navigable. The dimensions of the locks as originally constructed are unsuited to the better type of river boats of to-day, and the canal would have to be practically reconstructed to meet the present demands of navigation. Even if all rights to the canal were ceded to the United States, the board believes that it would be inadvisable to take possession of it. It seems clear that under existing conditions the United States would not be justified in improving this waterway, and therefore the board reports that it is not advisable for the General Government to undertake the work.

13. *Scope of present examination.*—The act calling for the present examination specifies that it shall be made with a view to improving the river in connection with the inland waterway between Savannah, Ga., and Fernandina, Fla. In view of this, the physical examination was limited to the lower part of the river, and more especially as the river is one which is subject to but slow changes, so that the condition of the upper part has not changed materially since the examination of 1910.

14. *Improvement desired.*—Letters requesting information as to the character and extent of improvement desired were sent to all parties reported to be interested in the improvement. The few replies received indicated little interest in the matter. One company stated that they owned the timber on 36,900 acres of land on this river, the land lying between Midville (mileage 171), and Meldrim (mileage 51), and that to enable them to raft or tow logs successfully. a channel with a minimum depth of 7 feet, and a minimum width of 30 feet would be necessary the year around. An answer received from Ellabelle (mileage 50), expressed the opinion that the river should be dredged at the crooks, sand bars, and various other places. The only other answer which suggested any improvement stated that the writer, who was considering the purchase of standing timber on the river, thought that no work beyond the removal of snags would be necessary to make the river navigable the greater part of the year.

15. *Commerce and navigation.*—The only commerce is on the lower river, where there is a very good channel. This commerce consists principally in the rafting of timber brought down from the Cannouchee River. It is reported by pilots that 7 feet at low water can be carried as far up as Kings Ferry (mileage 33), and that 8 feet at high water can be carried to the Ogeechee Canal (mileage 39). The most that could be expected of any improvement would be that it would force a reduction in railroad rates, but even this is problematical, since the river is paralleled on both banks by railroads for the greater part of its length; the long haul of 68 miles from the entrance to the Ogeechee Canal to Savannah River, if the inside water route were used, would be a serious if not prohibitory handicap. The distance to Savannah by railroad is but 14 miles from the two railroad bridges, 8 miles below the canal entrance.

16. *Prospective commerce.*—While it appears probable that a channel for light-draft steamboats or barges could be maintained during the greater part of the year for some distance up the river, to obtain it would probably be costly, and there is no indication that it would be used to an extent which would justify its establishment. A chan-

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nel which could be used by rafts of medium size for the greater part of the year could probably be obtained for a considerable distance up the river by removing the worst snags, with little or no additional work, but there appears at present to be little if any demand for such an improvement.

17. *Terminals, etc.*—There are no public or private terminals or transfer facilities, and there are no question of water power, or of other subjects so related to the improvement as to render it advisable in the interest of commerce and navigation.

18. *Conclusion.*—In view of the probable large cost of any adequate improvement and the probable small commerce that would be developed, it is my opinion that the Ogeechee River is not worthy of improvement by the General Government at the present time, and therefore a survey is not recommended.

W. C. LANGFITT,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see page 2.]

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 439.

LAKE TRAVERSE, MINN. AND S. DAK.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON REEXAMINATION OF LAKE TRAVERSE, MINN. AND S. DAK.

DECEMBER 17, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 16, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated August 11, 1915, together with copies of reports from Lieut. Col. Charles L. Potter, Corps of Engineers, and the Board of Engineers for Rivers and Harbors, dated July 10, 1915, and July 27, 1915, on reexamination of Lake Traverse, Minn. and S. Dak., made in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, August 11, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Reexamination of Lake Traverse, Minn. and S. Dak.

1. Under authority contained in section 14 of the river and harbor act approved March 4, 1915, there are submitted herewith for trans-

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mission to Congress report dated July 10, 1915, by Lieut. Col. Chas. L. Potter, Corps of Engineers, and report dated July 27, 1915, by the Board of Engineers for Rivers and Harbors, relative to the project for improvement of Lake Traverse, Minn. and S. Dak.

2. The existing project for improvement of this locality provides for dredging a channel through the narrows about 11,500 feet long, 50 feet wide at bottom, and 4 feet deep at mean low water. This project was adopted by the act of July 25, 1912, which appropriated therefor the full estimated cost of the improvement, amounting to $7,510. No work of construction under this project has been undertaken. The district officer reports that circumstances have arisen which necessitates a greatly increased estimate of the cost of the work. It appears that a drawbridge must be provided where the canal crosses a roadway, and that the dredging can not be done at the figure originally estimated, on account of the isolation of the locality. The district officer presents a revised estimate amounting to $25,000 for first construction and $2,400 annually for maintenance. He expresses the opinion, in which the division engineer concurs, that the probable benefits will not justify this expenditure and he recommends that the project be abandoned. The Board of Engineers for Rivers and Harbors concurs in this opinion and recommendation.

3. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore recommend that legislation be enacted authorizing the abandonment of the project for improvement of Lake Traverse, Minn. and S. Dak.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
July 27, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. This report on Traverse Lake, S. Dak. and Minn., is submitted under authority of that portion of section 14 of the act of March 4, 1915, which reads, "and the Chief of Engineers is directed to make a report upon any other projects, river or harbor, the further improvement of which under present conditions is undesirable, or in which modifications of the plans or projects should be made."

2. The existing project, adopted by the act of July 25, 1912, provides for dredging a channel through the narrows about 11,500 feet long, 4 feet deep at mean low water, and 50 feet wide at bottom, at an estimated cost of $7,510. No estimate for maintenance was included, as the investigations of the district officer indicated that none would be required. No work of construction has yet been done.

3. Since the adoption of the project it has been found that it is impracticable to do the work contemplated at the estimated cost, owing to the isolation of the locality, the difficulty of procuring a suitable dredging plant, and the necessity of providing and operating a draw

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bridge where the proposed cut crosses a public road. It has also been found that the Mustinka River, which discharges at the narrows and was probably the cause of the shoal through which it is proposed to cut, will carry sediment into the channel, necessitating occasional redredging at comparatively high cost.

4. The district officer presents a revised estimate based on present knowledge, which shows that the project will cost about $25,000 for first construction and $2,400 annually for maintenance. He is of opinion, in which the division engineer concurs, that the probable benefits will not justify this expenditure and that the project should be abandoned.

5. It will be seen from the foregoing that the first cost of the project will be over three times the original estimate and that it will require a considerable expenditure for maintenance that was not anticipated. It is the opinion of the board that there is not sufficient commerce, present and prospective, to justify this expense, and it therefore concurs in the views of the district officer and the division engineer and recommends legislation authorizing the abandonment of the project.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

REEXAMINATION OF LAKE TRAVERSE, MINN. AND S. DAK.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
St. Paul, Minn., July 10, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Special Report on Lake Traverse, Minn. and S. Dak.

1. Complying with fourth indorsement on report of this office, dated May 1, 1915, the following report is submitted:

2. Based upon the project outlined in House Document 1391, Sixty-first Congress, third session, the river and harbor act of July 25, 1912, provided $7,510 for the improvement of Lake Traverse, Minn. and S. Dak. The estimate was based upon figures for dredging obtained by the State of Minnesota in large ditching contracts. As soon as the matter was taken under advisement with a view to carrying out the project, it was found that no such price could be obtained. In ditching contracts the amount of material to be moved is generally large, much larger than in this project. The project necessitated the same cost of transporting, assembling, and dismantling of a dredge as did the large ditching contracts. It was early seen that the work could not be done for the estimate unless a dredge should happen to be already assembled in those waters for some other work.

3. It was also found that the canal crossed an existing public road for which a drawbridge must be built and maintained and possibly operated by the United States, a condition not provided for in the original estimate.

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4. As a result of these conditions the district officer made a revised estimate for the work, as follows:

Highway swing bridge	$6,000
52,000 cubic yards of excavation, at 30 cents	15,600
	21,600
Engineering and contingencies	2,200
Total	23,800

These estimates made no provision for maintenance. Lake Traverse was evidently at one time a continuous lake about 25 miles long extending in a generally northeasterly direction and emptying into the Bois des Sioux River, which unites with the Otter Tail and forms the Red River of the North. Into this continuous lake the Mustinka River entered nearly at right angles. The deposit from this river has formed a delta which has nearly separated the lake into two parts, there being no connection but a narrow, sluggish, shallow stream—simply enough to carry off water of the upper (southerly) lake, which has little drainage area. The project provided for connecting these two parts of Lake Traverse by a canal 50 feet wide and 4 feet deep, through the delta of the Mustinka, and following the general line of the connecting stream. Thus the proposed canal will be subjected to the deteriorating effect of the Mustinka's outflow, one channel of which will enter the canal at right angles. This must cause serious shoaling of the canal and require considerable maintenance. Such maintenance must be very expensive for the same reason that the original work will be expensive—the isolation of the locality from a proper plant to keep up the work. One season's outpouring of the Mustinka might, although not large in amount, completely put the canal out of commission and yet call for only a few thousand yards of dredging. To move a plant to the lake for these few thousand yards would make the cost very high. In a study of the situation it has appeared that the only practical way to excavate and maintain the canal would be for the United States to build and maintain a dredge for the work. This would call for a man at all times on the plant and would probably solve the question of operation of the drawbridge; he could care for the plant and operate the drawbridge.

5. Based on these conditions the following estimate is made:

For improvement:	
Highway bridge	$6,000
Cost of dredge with quarters	9,000
Excavating 52,000 cubic yards, at 15 cents	7,800
	22,800
Engineering and contingencies	2,200
	25,000
For maintenance:	
5 per cent on drawbridge ($6,000)	300
8 per cent on dredge (idle most of time)	720
Care of dredge (1 man 10 months, at $60)	600
Dredging 5,200 yards (10 per cent of original), at 15 cents	780
	2,400

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If there be added 4 per cent interest on the original cost (or $1,000) there will result an annual expense to the United States of $3,400. The question arising is whether the commerce will justify such an expense.

6. During the years 1908 and 1909 there were two receiving elevators on the lake—one at Diamond and one at Dakomin. In 1912 there was built a third elevator at a point about halfway between Diamond and the south end of the lake. These elevators receive the grain from the farmers' wagons, load it on barges, transport it to Valley Landing, and load it onto cars by another elevator. It is stated that the charge for the complete service is 2 cents per bushel for wheat and 1 cent for oats. This is a very reasonable figure and is practically the same as the simple elevator charges at the rail stations, the latter varying from 1 to 2 cents per bushel. The freight rates from the various stations concerned are as follows (per ton):

From—	To—	
	Twin Cities.	Head of lakes.
Browns Valley	1.92	2.30
White Rock	2.10	2.30
Wheaton	1.96	2.30

It will be seen that there is a slight advantage in favor of the grain going to Browns Valley rather than to White Rock if destined for St. Paul-Minneapolis.

7. The only available figures on the commerce of the lake are as follows:

	Tons.
1908	11,667
1909	15,000
1912	6,450
1913	7,600
1914	7,914

The first two figures were in the days of two receiving elevators and the last three in the days of three. The first two figures are also subject to some doubt. The elevators were then in the hands of parties whose records were questionable; whose great desire was to have the proposed project executed; and whose business methods did not find favor with the courts. There can be little question of the records of the last three years—the business being in the hands of a large Duluth wheat firm.

8. When two receiving elevators were in existence, it may be assumed that the commerce covered by the Diamond elevator was that between the halfway points from Diamond to Browns Valley and from Diamond to White Rock, with a little advantage for Diamond on account of the less freight rate from Browns Valley. The distances via Lake Shore and road are as follows:

	Miles.
Diamond to Browns Valley	15
Diamond to White Rock	16

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Allowing half a mile in favor of Diamond in the latter, it may be considered that the Diamond elevator covered 16 miles of lake frontage. The Dakomin elevator would not extend its business more than about halfway to Wheaton, since there is little difference between the rates from Browns Valley and from Wheaton. The distances are as follows:

	Miles
Dakomin to Valley Landing	12
Dakomin to Wheaton	11

The Dakomin elevator may be therefore considered as covering 11.5 miles of front, and the two (Diamond and Dakomin) thus cover 27.5 miles. The third elevator was built within 8 miles of Browns Valley. Its influence may be considered as extending within 4 miles of that point, making the two elevators on the west side cover 19.5 miles and the three elevators cover 31 miles. Applying these distances to the commerce, we find the following:

[Per mile of front.]

	Tons
1908	42
1909	56
1912	30
1913	26
1914	25

Since the country covered by these elevators is quite thoroughly developed, there appears little prospect of any great increase of commerce. Grain carried out of the country can be only so much per acre, and the land is almost entirely under cultivation. Grain covers nearly all the commerce on the lake. What supplies are brought in are simply those for a farming community, and since the land is practically all occupied there can be little increase in that direction. It does not appear that an average commerce of more than 250 tons per mile of lake front can be expected.

9. The next question is as to possible commerce which may be expected in the north (lower) lake. The canal is to be 4 feet deep and it may be assumed that no commerce will develop on a less depth. The 4-foot contour closes on a line between section 16 (east side) and section 2 (west side). The same contour leaves the shore a distance of 2,500 feet in the south part of section 16 (east side) and a similar distance on the south line of section 1 (west side). Even the 3-foot contour does the same on the west side. Therefore the limit of business is fixed at the section line between 16 and 21 (east side) and 1 and 12 (west side). On the west side this point is 6 miles from Diamond and 10 miles from White Rock. An elevator near the south line of section 1 would, therefore, cover about 8.5 miles of front. Considering the proximity of the east side to Wheaton and White Rock, and considering the obstruction to wagon haul caused by the Mustinka River, which has few or no bridges, the business on the east side would be too small to support an elevator. It is also inferior agricultural land. The 8.5 miles covered on the west side would produce, at the rate of 250 tons to the mile, a commerce of 2,125 tons. The reduced haul to the farmer might average 4.5 miles. Applying this to the tonnage that may be expected, there results nearly 9,600 ton-miles of haul saved to the farmers.

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10. Out of the 8.5 miles thus covered the Diamond elevator now covers 5.5 miles, leaving a possible acquisition to them of only 3 miles of lake front. It would be a poor investment for them to erect an elevator and wharf to do a business of 2,100 tons when they already have two-thirds of the same business at Diamond. On that two-thirds they would force upon themselves a 6-mile greater haul and the passage of a drawbridge. It is freely predicted that the elevator company would not build on the north lake with such a poor showing before them. The farmer will haul to Diamond in preference to White Rock from a point 8.5 miles north of Diamond or haul a longer distance and be subjected to a higher freight rate at White Rock. An elevator near the south line of section 1 (west side) would extend business to a point only 11.5 miles from Diamond.

11. We will assume that the elevator and wharf might be built and operated for an additional freight of 750 tons, the real benefit to be to the farmer on the hauling of 2,125 tons. The average cost of wagon haul in the United States has been stated to be 25 cents per ton-mile. Applying this to the 9,600 ton-miles of freight, there results a saving to the farmer of $2,400. Since the wheat must be loaded and unloaded for even the shorter haul (terminal costs are the same), it is probable that the actual haul for the increased distance would cost less. Comparing $2,400, which is believed to be large, with $3,400 (see par. 5 above), which is feared to be small, there appears to be little justification for the improvement.

12. The following conclusions result:

(*a*) The original estimate was too small.

(*b*) The revised estimate will result in an annual cost to the United States, including interest, of $3,400 at least.

(*c*) The saving to the public will be $2,400 at the most.

(*d*) The carrying out of the project under the revised estimate is not justified.

13. In the opinion of the district officer the improvement of Lake Traverse under the plan outlined in House Document No. 1391, Sixty-first Congress, third session, is not justified, and he recommends that the project be abandoned.

The map[1] submitted herewith is a lithograph gotten out by the former elevator company and is furnished to show the relation of the various points mentioned. For details of the lower (north) lake see map printed in House Document 1391, Sixty-first Congress, third session. On that map will be seen how the 4-foot contour leaves the shores at the points mentioned. It closes at a short distance off that sheet. If further details are desired, reference may be had to two other sheets submitted with the report but not printed.

Previous examinations, questions of water power, and terminal facilities are all covered in House Document 1391, Sixty-first Congress, third session, no change having occurred.

CHAS. L. POTTER,
Lieut. Col., Corps of Engineers.

[1] Not printed.

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[First indorsement.]

OFFICE OF DIVISION ENGINEER, WESTERN DIVISION,
St. Louis, Mo., July 13, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. Concurring in the recommendation of the district officer that the project for the improvement of Lake Traverse be abandoned.

C. McD. TOWNSEND,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors see p. 2.]

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 440.

FARMINGTON RIVER, CONN.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF FARMINGTON RIVER, CONN., WITH A VIEW TO THE REMOVAL OF THE BAR AT ITS MOUTH.

DECEMBER 17, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 16, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated August 16, 1915, together with copy of a report from Maj. G. B. Pillsbury, Corps of Engineers, dated June 11, 1915, with map, on preliminary examination of Farmington River, Conn., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, August 16, 1915.

From: The Chief of Engineers United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Farmington River, Conn.

1. There is submitted herewith for transmission to Congress report dated June 11, 1915, with map, by Maj. G. B. Pillsbury, Corps of

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Engineers, on preliminary examination of Farmington River, Conn., with a view to the removal of the bar at its mouth, called for by the river and harbor act approved March 4, 1915.

2. The Farmington River is a tributary of the Connecticut River, which it enters at a point about 5½ miles above the city of Hartford, Conn. The river has generally a steep slope and rapid current, and is crossed by numerous power dams, the lowest of these being at Poquonock, about 6¾ miles above the mouth. Considerable quantities of sand are carried by the river when in flood, and their deposition at the mouth has produced an extensive bar. The improvement desired is a channel through this bar of sufficient dimensions to admit vessels of the size that can navigate the Connecticut River above Hartford. There is no commercial navigation on the Farmington River at the present time, and the district officer believes there is no likelihood that any would follow the improvement. The cost of the improvement would be considerable, and frequent maintenance operations would be necessary. In view of all the circumstances the district officer expresses the opinion that the improvement of this river, with a view to the removal of the bar at its mouth, is not justified by any commercial benefit to be anticipated. The division engineer concurs in this opinion.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated July 13, 1915, concurring in the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Farmington River, Conn., with a view to the removal of the bar at its mouth, is not deemed advisable at the present time.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
July 13, 1915.

TO THE CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The following is in review of the district officer's report on preliminary examination of Farmington River, Conn., with a view to the removal of the bar at its mouth, submitted in compliance with the act of March 4, 1915.

2. This stream is a tributary of the Connecticut, which it enters 5½ miles above the city of Hartford. It is crossed by a number of power dams, the lowest of which is at Poquonock, about 6½ miles above the mouth of the river, and limits possible navigation to this reach. The depth over the bar at the mouth of the river is about 6 inches at summer stage. Above the mouth there is a depth of several feet for about a mile, when another bar is reached which affords but a few inches in depth at low stage.

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3. Between the mouth of the Farmington and Hartford the Connecticut River has a depth of about 3 feet at summer stage, and the improvement desired on the bar at the mouth of the Farmington is a channel of sufficient dimensions to permit such boats to enter the river as can navigate the Connecticut above Hartford.

4. There is no commerce on the Farmington River or on the Connecticut between the mouth of the Farmington and Hartford. A few rowboats and canoes are used for pleasure purposes on the Farmington and a few small power boats on this section of the Connecticut. The district officer expresses the opinion, in which the division engineer concurs, that the improvement of the Farmington River is not justified by any commercial benefit to be now anticipated.

5. The usual notice of unfavorable report has been sent to interested parties, but no communications on the subject have been received.

6. It seems clear, from the description of this stream, that the removal of the bar at its mouth would be comparatively expensive both in first cost and in subsequent maintenance, and that little or no commercial benefit could be expected. The board, therefore, concurs with the district officer and the division engineer and reports that, in its opinion, it is not advisable for the United States to undertake the improvement of the Farmington River, Conn., with a view to the removal of the bar at its mouth.

7. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other related subjects having any material bearing upon the improvement of navigation at this locality.

For the board.

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

PRELIMINARY EXAMINATION OF FARMINGTON RIVER, CONN.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
New London, Conn., June 11, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Preliminary examination of Farmington River, Conn.

1. The following report on the preliminary examination of the Farmington River, Conn., with a view to the removal of the bar at its mouth, is submitted in compliance with the requirements of the act of Congress approved March 4, 1915.

2. The Farmington River has its sources in western Massachusetts and Connecticut and flows in a general easterly direction in a zigzag course through the ranges of hills that parallel the Connecticut River, entering the latter 5½ miles above the city of Hartford, Conn. The length of the main stream, from the confluence of its east and west branches, is about 40 miles. Its longer tributary, the west branch, has a further length of about 34 miles.

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3. The river has generally a steep slope and rapid current, and is crossed by numerous power dams. The lowest of these is at Poquonock, about 6¾ miles above the mouth of the river. From the rapids below this dam to its confluence with the Connecticut the river is generally quite shallow, flowing with a gentle current over a gravel bed. The Farmington carries a considerable amount of sand when in flood, depositing it in the Connecticut River. The deposits have not only produced an extensive bar at the mouth of the Farmington, but have also built up an island whose size is progressively increasing. The depth over the bar at the mouth is about 6 inches at summer stage. Above this bar the Farmington has a depth of several feet for a distance of about a mile, when a second bar is encountered which affords but a few inches depth at low-water stage.

4. Between the mouth of the Farmington and Hartford the Connecticut River is generally shallow. It is obstructed in particular by two bars, one immediately below the mouth of the Farmington River and the other about 3 miles downstream, over both of which the available depth is limited to about 3 feet at summer stage. At Hartford the river becomes much deeper, and a channel 12 feet in depth, carrying a large commerce, is maintained from that city to its mouth. The improvement of the Connecticut above Hartford has long been under consideration, but as it involves the problem of surmounting the Enfield Rapids before any upstream commercial centers are reached, no active steps toward this improvement have been undertaken for many years, nor is there any comprehensive project covering such improvement.

5. The center of the town of Windsor lies on the Farmington River, at a distance of from 1 to 1½ miles above the mouth. The population of the entire town in 1910 was approximately 4,000, of which a portion only is grouped at the town center. The principal manufacturing industries of the town are at Poquonock and Rainbow, farther up the stream, the center being generally suburban and agricultural in character.

6. Two bridges cross the Farmington River at Windsor, both with fixed spans, but both affording ample headroom at low water, on account of the height to which they have been constructed in order to clear the backwater from the Connecticut when the latter is in flood. Between the mouth of the Farmington and Hartford two bridges with fixed spans cross the Connecticut, but headroom under these bridges at low water is also ample for any commerce likely to use the stream in its present condition.

7. There is no commercial navigation on the Farmington River at the present time, nor is there any navigation of such character in the reach of the Connecticut between the mouth of the Farmington and Hartford. The only boats now using the Farmington are canoes and rowboats. On the Connecticut there are few power-boat owners who are willing to cope with the difficulties of navigating that stream above Hartford, but nearly all of these yachtsmen prefer to limit themselves to the fifty-odd miles of easy and attractive navigation below that city. From three to five motor boats are, however, kept in the Connecticut River immediately above the town of Windsor, the owners finding this point somewhat more convenient for their purposes than is Hartford.

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8. The improvement desired at the bar at the mouth of the Farmington River, as evinced at a conference with interested parties on June 4, is a channel through this bar of sufficient dimensions to admit into the river vessels of the size that can navigate the Connecticut River above Hartford.

9. The cost of securing the desired improvement would be considerable, on account of the cost of reaching the site with a dredge. It would be entirely impracticable, in fact, to take in any ordinary dredge through the shoal reach of the Connecticut above Hartford to the site of the work. It is certain that the channel would shoal quite rapidly. Yearly dredging would probably be necessary to secure its maintenance.

10. The only benefit reasonably to be anticipated from the improvement is the convenience of the owners of a very limited number of small pleasure boats, who could land in the immediate vicinity of Windsor, instead of on the banks of the Connecticut a mile or two from the town, were a channel opened through the bar. I can see no likelihood that any commercial navigation would follow the improvement. Coal to the amount of probably 5,000 or 6,000 tons is, to be sure, now brought by rail to Windsor, and the mills up the river, now supplied from the railroad station at Windsor by team, undoubtedly consume a considerable amount of other bulk freight which could be transported by water were sufficient facilities afforded. The rail rate on coal to Windsor exceeds by about 35 cents per ton the rail rate to Hartford and by an even greater amount the water rate to that point. To reach Windsor by water it would be necessary, however, to transship the freight into very light-draft lighters at Hartford in order to get through the Connecticut River between that point and the mouth of the Farmington. There are no regular towboats in this region of sufficiently light draft to handle such lighters. As a feat, it is, indeed, entirely possible to work them up to the Farmington River, using small power boats or other extemporized means; but the cost of transportation would considerably exceed the difference in the rates between Hartford and Windsor. I may point out that for nearly a month of open navigation during each year the stage of the Connecticut and of the lower reach of the Farmington is sufficient to carry on navigation of this sort without any improvement. It has never been undertaken, for the evident reason that it would be unprofitable. Again, there are, along the banks of this section of the Connecticut, numerous farms intensively cultivated for the production of tobacco, to which several thousand tons of fertilizer are brought yearly. Below Hartford a large part of this fertilizer is brought by water from New York. Its transportation in light-draft barges above Hartford is not undertaken, though offering less difficulty than the transportation of coal to Windsor through this reach. Aside from the obstruction presented by the bar at the mouth of the Farmington River, it appears very evident, therefore, that the transportation of bulk freight to Windsor will not be seriously undertaken until the Connecticut River is improved above Hartford, no matter how extensive an improvement may be made in the Farmington River proper.

11. There being no commerce, there are no wharves or other terminal facilities on the Farmington River, nor does there appear to be

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need for the construction of such terminals. No question of the development or utilization of water power for industrial or other purposes is connected with the improvement of the bar at the mouth of the river.

12. In view of the circumstances detailed, I am of the opinion that the improvement of the Farmington River, Conn., with a view to the removal of the bar at its mouth, is not justified by any commercial benefit to be now anticipated.

G. B. PILLSBURY,
Major, Corps of Engineers.

[First indorsement.]

OFFICE OF THE DIVISION ENGINEER, NORTHEAST DIVISION,
New York City, June 12, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

Forwarded, concurring in the views of the district engineer officer.

FREDERIC V. ABBOT,
Colonel, Corps of Engineers.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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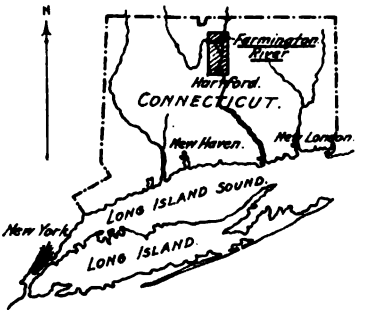
CORPS OF ENGINEERS, U. S. ARMY.



STATUTE MILES

0 50 100

FARMINGTON RIVER
CONNECTICUT

STATUTE MILES

0 1 2 3 4

ENGINEER OFFICE, U. S. ARMY,
NEW LONDON, CONN.,
JUNE 11, 1915.

TO ACCOMPANY REPORT ON PRELIMINARY EXAMINATION OF FARMINGTON RIVER, CONNECTICUT, WITH A VIEW TO THE REMOVAL OF THE BAR AT ITS MOUTH, MADE IN COMPLIANCE WITH ACT OF CONGRESS APPROVED MARCH 4, 1915.

MAJOR, CORPS OF ENGINEERS.

House. Doc. No. ; 64th Cong., 1st Sess.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 441.

EDISON SLOUGH, WASH.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON PRELIMINARY EXAMINATION OF EDISON SLOUGH, WASH.

DECEMBER 17, 1915.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, December 16, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated October 22, 1915, together with copy of a report from Lieut. Col. J. B. Cavanaugh, Corps of Engineers, dated August 12, 1915, with map, on preliminary examination of Edison Slough, Wash., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, October 22, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination of Edison Slough, Wash.

1. There is submitted herewith for transmission to Congress report dated August 12, 1915, with map, by Lieut. Col. J. B. Cava-

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naugh, Corps of Engineers, on preliminary examination authorized by the river and harbor act approved March 4, 1915, of Edison Slough, Wash.

2. Edison Slough is a small tidal estuary at the head of Samish Bay, Wash. It extends to the town of Edison, having a population of 300 and located three-fourths of a mile above the mouth. Immediately above the town a dam separates the slough from the North Samish River, of which it was originally a part. The entrance to the slough is across the extensive flats of Samish Bay, which are exposed at low water for more than a mile from shore. Vessels drawing as much as 5 feet can enter the slough and reach Edison at high water, but navigation is difficult, due principally to sharp bends in the channel. The improvement desired is the removal of projecting points and deepening and widening the channel at the bends. The commerce consists principally of logs, but there is a small amount of farm produce carried in trading launches which make occasional visits. The district officer reports that the amount of dredging necessary to restore the channel and make it reasonably adequate for the present business is small and can be done by the United States snag boat operating under the appropriation for improving Puget Sound and its tributary waters, under which the slough has heretofore been cleared of snags and a small amount of dredging done. He expresses the opinion that the locality is worthy of improvement, but only to the limited extent indicated above. The division engineer concurs in this opinion.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated September 14, 1915, concurring in the views of the district officer and the division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore report that the improvement by the United States of Edison Slough, Wash., is deemed advisable from time to time to the extent now authorized by the existing project for improvement of Puget Sound and its tributary waters. It is not deemed advisable, however, to undertake any additional improvement at the present time.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
September 14, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. The following is in review of the district officer's report on preliminary examination of Edison Slough, Wash., called for by the act of March 4, 1915.

2. Edison Slough is an estuary of Samish Bay, about 12 miles south of the city of Bellingham. On it is the town of Edison, with a popu-

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lation of 300. The slough is dry at low tide, as is also the bay at the mouth of the slough for a distance of about a mile, but boats drawing 5 feet can proceed at high water up to Edison, three-quarters mile above the mouth.

3. The commerce consists principally of logs, but there is a small amount of farm produce carried on accasional trading launches. There is in prospect some business in dairy products.

4. The improvement desired is the removal of projecting points and some deepening of the channel at the bends. The district officer states that the amount of work required to make the channel reasonably adequate for present commerce is not large and can be done with the United States snag boat under existing authority from funds appropriated for the improvement of Puget Sound and its tributary waters. Some work has been done already under the general authority mentioned, and the district officer and the division engineer believe that the slough is worthy of a continuance of the improvement in accordance with present authority.

5. It appears from the information now in hand that the commerce on this waterway is not large and that there is no prospect of its becoming extensive. It is, however, of some importance, and the slough is one of those waterways whose improvement was contemplated when the general appropriation for Puget Sound and its tributary waters was made. The board is in accord with the views of the district officer and the division engineer, and it recommends the further improvement of Edison Slough, Wash., from time to time under the general authority referred to above. It does not appear advisable, however, to undertake any greater improvement at this time than is authorized by the existing project.

6. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other related subjects having any material bearing upon the improvement of navigation at this locality.

For the board:

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

PRELIMINARY EXAMINATION OF EDISON SLOUGH, WASH.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Seattle, Wash., August 12, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Preliminary examination of Edison Slough, Wash.

1. In compliance with section 15, river and harbor act of March 4, 1915, and instruction contained in your letter of March 15, 1915, the following report, with map,[1] is submitted as a preliminary examination of Edison Slough.

[1] Vicinity part of map only printed.

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2. Edison Slough is the name given to the estuary of the North Samish River, a small stream 10 miles long, in Skagit County, Wash. This slough enters tide water at the head of Samish Bay, about 12 miles south of the city of Bellingham.

3. The only town on the slough is Edison, with a population of 800, located at the head of navigation, three fourths mile above the mouth.

4. The slough immediately above Edison was a few years ago closed by a dam and the river water diverted to Samish River proper. Edison Slough is now, therefore, merely a tidal arm of Puget Sound, no water remaining in the channel at low tide since the construction of this dam.

5. The slough is quite crooked, its length being 1¼ miles measured along its axis and but three-fourths mile in a direct line. The channel has deteriorated in recent years and several projecting points render navigation difficult.

6. The entrance into Edison Slough is across the extensive tide flats of Samish Bay, which are exposed at low water for more than a mile from shore. Vessels drawing as much as 5 feet can enter the slough and reach Edison at high water, but navigation is difficult, due principally to sharp bends in the channel.

7. Except for occasional trips of small trading launches and pleasure boats, the only commerce at present is the towing of logs up the channel to supply a small shingle mill at Edison which uses about 100,000 feet of cedar logs per annum. This mill is a cooperative plant and runs continuously.

8. The Samish Valley is approximately 6 by 10 miles in extent and is principally devoted to agriculture and dairying. Ten thousand tons of oats and 2,800 tons of hay were raised in the vicinity of Edison last year. The greater part of this crop was hauled to the railroad, the remainder being shipped by water. A condensary which will handle milk from 1,000 to 1,200 cows is practically completed, but no statistics are available as to the dairy products.

9. Two railways serve this district, the Great Northern, with a station at Bow, 3 miles from Edison, and the Interurban, which operates between Bellingham and Mount Vernon, and has a station called Edison, about 1 mile from the town of Edison.

10. The improvement desired is the removal of projecting points and deepening and widening the channel at the bends by dredging. The amount of dredging necessary to restore the channel and make it reasonably adequate for the present commerce is small and can be done by the United States snag boat operating under the appropriation for improving Puget Sound and its tributary waters, Washington, and any amount greater than can readily be provided for in this manner would not be justified by the resulting benefits to commerce. The slough has been cleared of snags by the snag boat and a small amount of dredging has already been done.

11. In my opinion, therefore, Edison Slough is worthy of improvement, but only to the limited extent indicated above, which can be carried out with the United States snag boat and with funds now available.

12. In compliance with law, I have to report, also, that it is not practicable to coordinate with any improvement of Edison Slough.

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either flood protection or the development and utilization of water power for commercial purposes so as to reduce the cost of improvement.

J. B. CAVANAUGH,
Lieut. Col., Corps of Engineers.

[First indorsement.]

UNITED STATES ENGINEER OFFICE,
NORTHERN PACIFIC DIVISION,
Portland, Oreg., August 16, 1915.

To CHIEF OF ENGINEERS.

1. Forwarded.

2. It appears from paragraph 10 that the improvement desired is the removal of projecting points and the deepening and widening of the channel at bends. It appears that the improvement may be executed under existing law and with available funds from a general appropriation; or allotment, for improving Puget Sound and its tributary waters, Washington. The district officer proposes to do such work, as in his opinion is justifiable, in that way. Whether or not the work proposed by him will entirely meet the desires of the interests responsible for the provision in the act of March 4, 1915, is not quite clear. It is assumed that they will be met to such a degree that the report may be classed as favorable.

3. The division engineer concurs in the views of the district officer as stated in paragraph 11, and recommends that Edison Slough be given reasonable improvement in the manner outlined.

CHAS. L. POTTER,
Lieut. Col., Corps of Engineers,
Division Engineer.

[For report of the Board of Engineers for Rivers and Harbors, see p. 2.]

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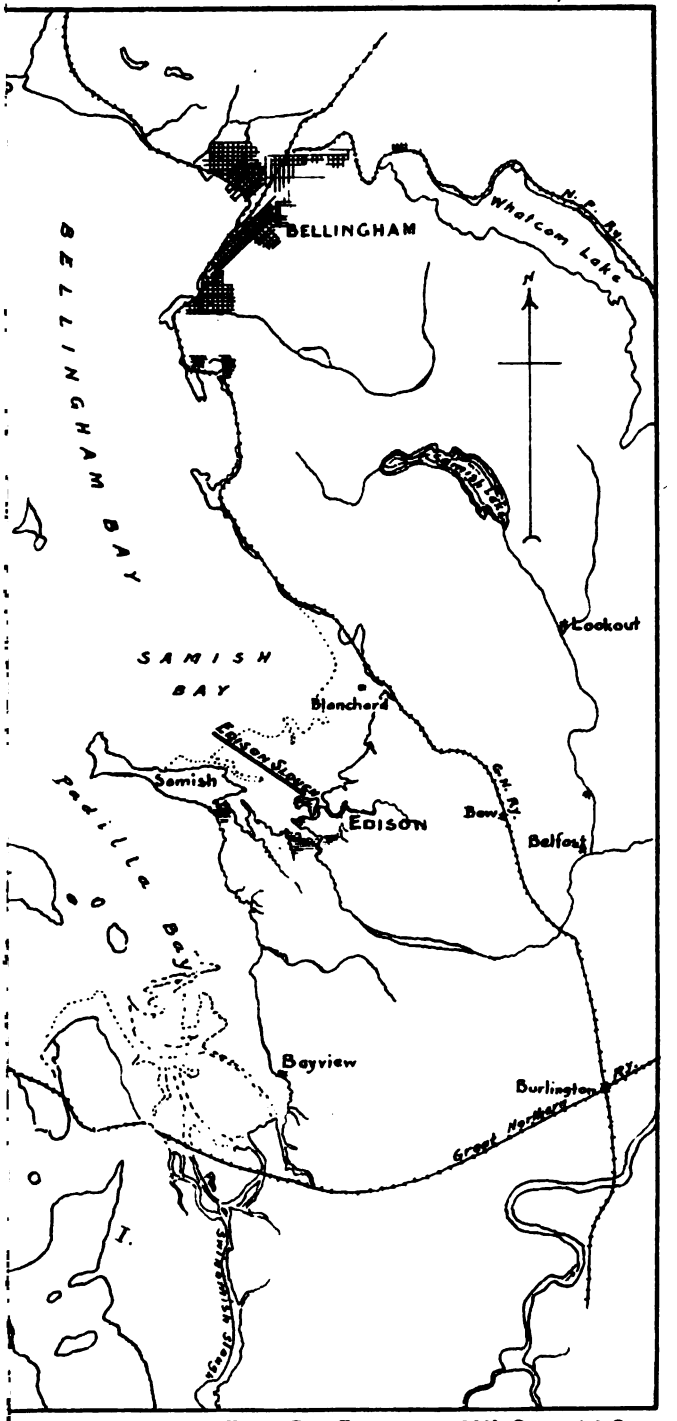

House Doc. No. ; 64th Cong., 1st Sess.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 460.

LONG BEACH HARBOR, CAL.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORTS ON PRELIMINARY EXAMINATION AND SURVEY OF LONG BEACH HARBOR, CAL., WITH A VIEW TO THE EXTENSION OF THE JETTIES AT THE HARBOR ENTRANCE TO THE 30-FOOT CONTOUR IN SAN PEDRO BAY AND TO PROVIDING AND MAINTAINING A CHANNEL 30 FEET IN DEPTH AND OF SUITABLE WIDTH, AND WITH A FURTHER VIEW OF CONNECTING THE LONG BEACH HARBOR WITH THE LOS ANGELES HARBOR BY A CHANNEL 600 FEET IN WIDTH AND 30 FEET IN DEPTH, CONSIDERATION BEING GIVEN TO THE QUESTION OF COOPERATION ON THE PART OF LOCAL INTERESTS.

JANUARY 4, 1916.—Referred to the Committee on Rivers and Harbors and ordered to be printed, with illustration.

WAR DEPARTMENT,
Washington, January 3, 1916.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, dated 29th ultimo, together with copies of reports from Maj. R. R. Raymond, Corps of Engineers, dated June 16, 1915, and August 3, 1915, with map, on preliminary examination and survey, respectively, of Long Beach Harbor, Cal., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 29, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Preliminary examination and survey of Long Beach Harbor, Cal.

1. There are submitted herewith for transmission to Congress reports dated June 16, 1915, and August 3, 1915, with map, by Maj.

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R. R. Raymond, Corps of Engineers, on preliminary examination and survey, respectively, authorized by the river and harbor act approved March 4, 1915, of—

Long Beach Harbor, California, with a view to the extension of the jetties at the harbor entrance to the thirty-foot contour in San Pedro Bay and to providing and maintaining a channel thirty feet in depth and of suitable width, and with a further view of connecting the Long Beach Harbor with the Los Angeles Harbor by a channel six hundred feet in width and thirty feet in depth, consideration being given to the question of cooperation on the part of local interests.

2. Long Beach Harbor is situated about 4 miles easterly from the entrance to Los Angeles Harbor. It is largely artificial and consists of a jettied entrance, a dredged channel between the jetties, short interior channels or slips, and a turning basin, all to a depth of about 20 feet. No work has been undertaken by the United States, these improvements having been made entirely by local interests. The district officer finds no justification at this time for the United States to undertake any improvement of the entrance to the harbor, but he believes that under certain conditions it is advisable to provide a connecting channel between Long Beach and Los Angeles Harbors. While the act contemplates a channel 600 feet wide and 30 feet deep, he is of opinion that for present and immediately prospective needs a channel 200 feet wide and 24 feet deep will be adequate. Such a channel is estimated to cost $386,300, and is recommended by him on condition that the flood waters are diverted from Los Angeles and Long Beach Harbors as proposed in a separate report upon that subject, and that local interests will contribute toward the work the sum of $242,300, and deed to the United States, free of cost, an additional strip of land 200 feet wide alongside the present 400-foot right of way. The division engineer suggests the advisability of extending the San Pedro breakwater sufficiently to protect the entrance to Long Beach, but states that if there is no chance of this larger project receiving consideration, he would concur in the views expressed by the district officer.

3. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated October 12, 1915. In connection with its consideration of the subject, the board visited the locality and received assurance from local interests that the additional strip of land 200 feet wide required for right of way would be furnished and that they are prepared to cooperate further by contributing a sufficient sum to meet the cost of that portion of the proposed connecting channel lying within the limits of the city of Long Beach. The board is of opinion that the depth proposed by the district officer is greater than is required at the present time, and in response to its request the district officer has furnished an estimate for a channel 20 feet deep and 200 feet wide, amounting to $317,900. In view of the willingness of the city of Long Beach to do all necessary work on the connecting channel in its own harbor if the United States will undertake that portion which lies in Los Angeles Harbor and forms a part of its ultimate development, the board believes that the commercial interests to be served by such a channel are sufficient to warrant cooperation by the United States to this extent under certain conditions which it specifies.

4. After due consideration of the above-mentioned reports, I concur in the views of the Board of Engineers for Rivers and Harbors,

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and therefore report that the improvement by the United States of "Long Beach Harbor, Cal., with a view to the extension of the jetties at the harbor entrance to the thirty-foot contour in San Pedro Bay and to providing and maintaining a channel thirty feet in depth and of suitable width, and with a further view of connecting the Long Beach Harbor with Los Angeles Harbor by a channel six hundred feet in width and thirty feet in depth, consideration being given to the question of cooperation on the part of local interests," is not deemed advisable at the present time; but that it is deemed advisable for the United States to cooperate with local interests in constructing a channel 200 feet wide and 20 feet deep at mean lower low water connecting Long Beach Harbor with Los Angeles Harbor at a total estimated cost of $317,900, of which the United States shall undertake only that part of the improvement which lies in Los Angeles Harbor, at an estimated cost of $130,350, provided that local interests deed to the United States, free of cost, an additional strip of land 200 feet wide alongside the present right of way and agree to construct and maintain that part of the channel lying within the limits of the city of Long Beach, and provided further that work shall not be commenced by the United States on its part of the channel until the necessary steps have been taken to protect it from flood deposits of silt, or until local interests have agreed to maintain this part pending the completion of protecting works. The total amount to be expended by the United States, $130,350, should be provided in one appropriation.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS ON SURVEY.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
October 12, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. The following is in review of the district officer's reports submitted under authority of the act of March 4, 1915, on preliminary examination and survey of—

Long Beach Harbor, California, with a view to the extension of the jetties at the harbor entrance to the thirty-foot contour in San Pedro Bay and to providing and maintaining a channel thirty feet in depth and of suitable width, and with a further view of connecting the Long Beach Harbor with the Los Angeles Harbor by a channel six hundred feet in width and thirty feet in depth, consideration being given to the question of cooperation on the part of local interests.

2. Long Beach Harbor, situated about 4 miles easterly from the entrance to Los Angeles Harbor, is largely artificial. It consists of a jettied entrance, a dredged channel between the jetties, short interior channels or slips, and a turning basin, all to a depth of about 20 feet. The harbor lies within the limits of the city of Long Beach.

3. The question of the United States undertaking the improvement of this harbor has been twice reported upon adversely. Physical conditions have not greatly changed since those reports were submitted, but there has been a considerable growth in the city of Long Beach, which now has a population of about 32,000, and some new

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industries have come into existence. The water-borne commerce has never been large.. During 1914, 117 steamers entered the harbor, carrying a commerce of 22,345 tons. The district officer states that in addition to the commercial value the harbor has a military value. He finds no justification at this time for the United States undertaking any improvement of the entrance to the harbor, but he believes that under certain conditions it is advisable to provide a connecting channel between Long Beach and Los Angeles Harbors.

4. The act contemplates a channel 600 feet wide and 30 feet deep, but the district officer is of opinion that for present and immediately prospective needs a channel 200 feet wide and 24 feet deep will be adequate. Such a channel is estimated to cost $386,300. This he recommends on condition that the floods are diverted from the harbors as proposed by him in another report, and local interests will contribute the sum of $242,300 toward the work and deed to the United States, free of cost, an additional strip of land 200 feet wide alongside the present 400-foot right of way. The division engineer suggests a comprehensive treatment of the harbor problems by an extension of the San Pedro breakwater sufficiently to protect the entrance to Long Beach Harbor, and thus provide a sheltered outer harbor of considerable area. He states that if there is no chance of this larger project receiving consideration, he would concur in the views expressed by the district officer.

5. During its consideration of this subject the board visited the locality and gave a hearing to interested parties at Los Angeles on August 18, 1915. It also secured from the district officer an estimate for a connecting channel 20 feet deep and 200 feet wide, amounting to $317,900. It was stated at the hearing that arrangements have been made whereby local interests will furnish the additional strip of land 200 feet wide, referred to by the district officer, and that they are prepared to cooperate further by contributing a sufficient sum to meet the cost of that portion of the proposed connecting channel lying within the limits of the city of Long Beach. The length of the proposed channel is about 11,700 feet, of which 6,800 feet is in Long Beach Harbor and 4,900 feet in the East Basin of Los Angeles Harbor. On this basis the estimates for a channel 200 feet wide and 20 feet deep would be $187,550 in Long Beach Harbor and $130,350 in Los Angeles Harbor.

6. There has been expended on Long Beach Harbor by local interests over $1,000,000. A city of considerable size has sprung up, a number of important industries have been established, and the foundation of a large development has been laid. The United States has, however, undertaken at large expense to provide for all pressing needs of the general commerce of the country adjacent by its work in Los Angeles Harbor, and, in the opinion of the board, the time has not come when it is necessary or advisable for it to enter upon the improvement of Long Beach Harbor. In view, however, of the fact that the city of Long Beach has expressed its willingness to do all necessary work on the connecting channel in its own harbor if the United States will undertake that portion which lies in Los Angeles Harbor and forms a part of its ultimate development, the board believes that the commercial interests to be served by such a channel are sufficient to warrant cooperation by the United States to this extent. The depth of the channel should be about the same as that provided generally in Long Beach Harbor, and there appears

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to be no present or immediately prospective need of making the depth greater than 20 feet.

7. Under present conditions of exposure to silt deposits in these harbors, such a connecting channel would be liable to obliteration in a single flood from the Los Angeles River, and the cost of maintenance would then be excessive. The United States, therefore, should not undertake the work until these harbors are adequately protected from such deposits, as recommended in another report of this date on the diversion of the Los Angeles River and its tributary waters [published in H. Doc. No. 462, 64th Cong., 1st sess.] or until in the absence of such protection, local interests assume all cost of maintenance pending the completion of necessary works of protection.

8. In view of the foregoing, the board reports that in its opinion it is advisable for the United States to undertake the provision of a connecting channel between Long Beach and Los Angeles Harbors, 20 feet deep at mean lower low water and 200 feet wide, at a total cost of $317,900, provided local interests deed to the United States, free of cost, an additional strip of land 200 feet wide, and agree to construct and maintain that part of the channel lying within the limits of the city of Long Beach, and provided further that work shall not be commenced by the United States on its part of the channel until the necessary steps have been taken to protect it from flood deposits of silt, or until local interests have agreed to maintain this part pending the completion of protecting works. The total amount to be furnished by the United States, $130,350, should be made available in one appropriation.

9. In compliance with law, the board reports that, except as contemplated by the above recommendations, there are no questions of terminal facilities, water power, or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

For the board.

FREDERIC V. ABBOT,
Colonel, Corps of Engineers,
Senior Member Present.

PRELIMINARY EXAMINATION OF LONG BEACH HARBOR, CAL.

UNITED STATES ENGINEER OFFICE,
Los Angeles, Cal., June 16, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers United States Army
(Through the Division Engineer).
Subject: Preliminary examination of Long Beach Harbor, Cal.

1. The following report is submitted in compliance with department letter dated March 15, 1915:

2. The river and harbor act approved March 4, 1915, calls for a preliminary examination of—

Long Beach Harbor, California, with a view to the extension of the jetties at the harbor entrance to the thirty-foot contour in San Pedro Bay and to providing and maintaining a channel thirty feet in depth and of suitable width, and with a further view of connecting the Long Beach Harbor with the Los Angeles Harbor by a channel six hundred feet in width and thirty feet in depth, consideration being given to the question of cooperation on the part of local interests.

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3. A description and history of the locality and a discussion of the local conditions are embodied in the report of Mr. D. E. Hughes, assistant engineer, quoted below, which has been prepared after full discussion between Mr. Hughes and myself, and is included in this report as an essential part thereof.

LOS ANGELES, CAL., *May 14, 1915.*

A preliminary examination report of this harbor is contained in House Document No. 27, Sixty-second Congress, first session, which contains descriptive matter. Additional description and later history are given in House Document No. 896, Sixty-third Congress, second session, in preliminary report, page 17, and survey report, page 52, which contains a map showing the relation of this harbor to Los Angeles Harbor.

In the latter report the district engineer, then Lieut. Col. C. H. McKinstry, Corps of Engineers, recommended Government participation either in improving the sea entrance or in dredging the inside channel connecting with Los Angeles Harbor and expressed his preference for the latter, in which preference the division engineer concurred; but the Board of Engineers held that there was not sufficient commerce then to warrant the large expenditure by the United States as proposed by the district officer, namely, $488,000. The Chief of Engineers concurred with the board in the opinion that it was not advisable for the United States to undertake the improvement at that time.

Since the time of the above-mentioned reports by Col. McKinstry in 1913, some dredging has been done. The flood of 1914 caused much deterioration. But a part has been restored, and the ocean entrance has been redredged and deepened to 20 feet. Nothing more has been done in the connecting channel.

Early in 1914 the City of Long Beach voted bonds to the amount of $625,000 for harbor improvement, of which $500,000 was intended for use in cooperation with the Government in improving the sea entrance. It is understood that a portion of the money could now be made available for cooperation with the United States in improving the connecting channel instead of the sea entrance channel, if such course should be preferred and approved by the Government.

Thus could the cost estimated at $488,000 in Col. McKinstry's recommendation of a connecting channel 200 feet wide and 24 feet deep be now divided between the Government and the City of Long Beach. In this connection it is not to be overlooked that a large part of the above estimate of $488,000 was for dredging within the east basin of Los Angeles Harbor, since over 4,000 feet of the length was within that basin and only 7,000 feet was beyond it, or in the connecting channel proper.

Commercial statistics would be of no value in this report, for, on account of the floods of 1914 and 1915 interrupting shipping and making uncertain the future prospects of the harbor, development of commerce has not been natural. But, assuming that river floods will be diverted from the harbor district, commerce will grow like the city.

To understand the mistaken notion that this was to be regarded an independent harbor rather than a part of the one larger harbor district—an error fostered by civic pride till floods taught dependence—it is necessary to go back a few years in history. Wilmington Harbor was formerly regarded as extending to Long Beach, and having the river mouth as its eastern entrance, as shown by War Department survey of 1883. At a later date the erroneous idea was held for a time that only up to the turning basin near San Pedro did the Government have jurisdiction. Such was the view when, in 1905, Long Beach Harbor work originated. Not till 1909 was there a Los Angeles Harbor—only a San Pedro Harbor, in which no harbor improvement had been made other than by the Government. The Long Beach Harbor men's first thought was to have only an inside channel connecting with the turning basin at San Pedro, but intervening landowners and tide-land claimants were in the way. Then the ocean entrance was embraced instead, which gave birth to the idea of independence—an idea since nurtured by the fact that only private and municipal funds were being expended. But a few men never lost the thought to which Long Beach is rapidly returning, that, as expressed in Col. McKinstry's report, "Los Angeles and Long Beach Harbors are destined to be one, and it would be rash to say that the depth of 30 feet will never be required in the easterly part of the joint harbor, or that a second deep entrance will never be necessary."

Another idea not unlikely to enter a stranger's mind is that work on the connecting channel would not be for the improvement of a navigable water but for the construction of an inland canal. Such view, however, would be erroneous. Long Beach was naturally connected with Los Angeles Harbor by Cerritos Slough, which was used for navigation, and which was judicially determined to be navigable water of the United States by the Federal court, whose finding was, in part, that "The uncontradicted evidence, written and oral, adduced at this hearing, shows the following

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facts: That Cerritos Slough is navigable; that defendant's bridge was built without authority of Congress or the Legislature of California, and obstructs the navigation of said slough, * * *." (No. 1219, U. S. Circuit Court, Southern District of California. Horace S. Carver et al. *v.* San Pedro, Los Angeles & Salt Lake Railroad Co. Filed June 25, 1906.)

The slough being very crooked, the Salt Lake Railroad Co. and the Los Angeles Dock & Terminal Co. obtained permission to cut off bends and make it straight, to the advantage both of navigation and of the lands traversed by it. A straight strip of land 400 feet wide and about 7,000 feet long was deeded therefor to the United States. On June 11, 1908, the War Department granted permission to fill the Cerritos Slough upon condition that an equivalent channel be first dredged on the straight course. The easterly 4,000 feet of this 7,000-foot equivalent channel is already dredged, and a portion of the slough south of it, together with the adjacent lowlands, has been reclaimed.

The question therefore is not one of excavating a canal to connect independent harbors, but one of improving a legal substitute for a natural navigable waterway at the head of which much development of commercial facilities has been made by municipal and private interests, where a second entrance is available for improvement as needed, and where an important city is already established.

It is sometimes said that there can be no general public need for the additional facilities until the westerly part of the bay, now called Los Angeles Harbor, shall be no longer able to accommodate the growth of commerce. But like thoughts would apply against Federal improvement of a second place in other bays till the first had become congested. Such course, however, would be contrary to common practice, and rightly so, for in so far as the benefits are local as well as national it is better to have them distributed than concentrated.

The river and harbor act contemplates a width of 600 feet for the connecting channel. The width of land deeded therefor is 400 feet. Col. McKinstry, in his report referred to above, thought 600 feet will be ultimately required with a depth of 30 feet, and recommended that the smaller channel proposed by him, 24 feet deep and 200 feet wide on the bottom, be not undertaken unless 200 feet additional to the 400 feet shall be deeded to the United States.

The 400 feet already deeded is commonly regarded a generous donation, since it is much in excess of the area of the main slough to be displaced. But it may not be so great in area as the slough, and it branches together with the adjacent tidelands up to ordinary high-tide mark. Hence perhaps the 600 feet proposed requirement is justified as an exchange, if the Government, in the absence of the exchange, would have free jurisdiction for channel purposes up to ordinary high-water mark everywhere, notwithstanding a United States patent includes the land.

It is not known to the writer whether the 600 feet suggested by Col. McKinstry was to include the side slopes of a channel, which in this material, would approximate 100 feet each for an excavation 30 feet deep, thus making a channel 400 feet wide on the bottom be 600 feet wide on top. It is to be presumed that the owners of abutting properties would choose to have the side slopes excavated within their lands, for otherwise their holdings would not reach deep water. It seems, therefore, that unless the channel is to be wider than 400 feet on the bottom, making it about 600 feet wide on top, the width of 400 feet already deeded would be sufficient, provided, of course, the adjoining landowners would follow their own best interests, and allow the side slopes, if any, to be within their lands. It is learned, however, that the railroad company is now willing and ready to deed the additional 200 feet of land.

It seems to the writer that in this waterway, situated where only a fraction of the harbor's shipping would ever use it, a bottom width of 400 feet would be sufficient, particularly since the channel would be without bends, and would have a turning basin at each end. Besides, the prevailing winds are lengthwise of the channel. Of course, a greater width would permit faster travel without undue disturbance to vessels at the wharves, which is important in more congested waterways; but freight rates would not be lowered. A greater width of channel would better accommodate slips which sometime may be desired on either side; but since the lands are in private possession, any widening to accommodate slips into them would be a private work. Besides, where waters are so still, and tidal currents are so weak, vessels much longer than 400 feet could enter from a 400-foot channel into a slip of reasonable width and oblique in direction.

Since the channel, if improved, would extend along the south side of the east basin of Los Angeles Harbor, thence through the San Pedro, Los Angeles & Salt Lake Railroad Co.'s land, much to its benefit, that company could be expected to cooperate in the work.

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What degree of cooperation would be just can not be calculated. The south line of the east basin, as defined by the pierhead line, was made coincident with a line of monuments set by some earlier surveyor in his attempted relocation of the so-called "exception line," which, by the United States Surveyor General's survey in 1857, as set forth in the patent, segregated the "Inner Bay of San Pedro" from the San Pedro Rancho grant. Much of the land adjacent to the east basin on its south side, though seemingly embraced by the United States patent and therefore claimed by the Salt Lake Railroad Co., successor in interest, is below ordinary high-tide level.

The city of Los Angeles has brought suit to quiet title to so much of this land as lies below the average height of all high tides, or 5.1 feet, claiming that it is tideland, and therefore that the United States patent is not to be construed as embracing it. Besides, there is an apparent conflict in the notes of the survey by the United States Surveyor General and included in the patent, which may be an element to be considered in the suit. According to the survey notes, the easterly line of the excepted area, which is on or near the easterly pierhead line of the east basin and which had its origin at high-water mark on the Wilmington side, was recorded as "59 chains" long and also as extending "to station at sand hills," which are much farther south. Until this suit is settled it can not be stated whether the railroad company would be directly benefited by dredging along the south side of the east basin.

As to the 7,000 feet of channel easterly of the east basin, its improvement would undoubtedly enhance the value of the railroad company's lands adjoining it. Hence it would not be unreasonable to expect some help from that company if the improvement should be authorized. A likely first thought is that deeding the 400-foot strip, or 600-foot, as the case may be, is advance cooperation; but, as indicated on preceding page, it may be held that full exchange for the land has been already made, through provisional surrender of sloughs and tidelands outside of that area.

Cooperation by the railroad company, the Los Angeles Dock & Terminal Co., and the city of Long Beach, or any of them, if amounting to half the cost of improving the inside channel, would not leave the United States much work to pay for outside of the east basin of Los Angeles Harbor, which contains three-eighths of the length.

Engineers on this coast could hardly doubt that in this vicinity the commercial harbor will be mostly inside the coast line away from the ocean surge; and that there is a coming need for the improvement of the so-called connecting channel to a depth of 30 feet and a width of 400 feet on the bottom or 600 feet on top. But only an installment of the work needs to be considered at this time, since a partial excavation 200 feet wide on the bottom and 24 feet deep, as recommended by Col. McKinstry and Col. Rees, would be sufficient for the present and near future. The survey therefor, if authorized, would include but little field work, since the ground was well covered only two years ago.

As to improving the Long Beach entrance from the sea, nothing has occurred to change the judgment of two years ago, that it would be more advantageous to the general public to first improve the inside connecting channel. It seems certain, however, that at some future time when commerce shall have grown many fold, the eastern entrance to the joint or consolidated harbor will become such a convenience, if not a necessity, that no doubt will remain of the advisability of deepening it to 30 feet or more and of providing breakwaters for its protection. In the meantime, though the inside connecting channel shall be improved as needs require, the sea entrance should be guarded against artificial obstruction, not only to preserve it for the anticipated greater use in the future, but also that local interests may be free and encouraged to maintain it for whatever local advantages it may continue to afford.

The foregoing has been written on the supposition that silt-bearing river floods will be diverted from the harbor district. If such diversion be not made, and if the river shall be led to sea between the present harbors instead, then the connecting channel would be severed, making it, of course, unworthy of improvement; and then Long Beach Harbor must thereafter be a separate and independent thing, whose improvement by the Federal Government would now be considered, according to precedents, unworthy, because of its proximity to the Los Angeles Harbor.

If the river in its present condition be confined to an outfall in Long Beach Harbor, then the connecting channel should not be improved, but closed for the protection of Los Angeles Harbor, and improvement or maintenance of Long Beach Harbor or its ocean entrance would become of questionable advisability, even as a local enterprise.

If, however, the river should be confined to the easterly area of Long Beach Harbor, and the present ocean outlet, leaving the rest of the harbor and its lands without an outlet other than to Los Angeles Harbor, then the improvement of the connecting channel without cooperation by Long Beach would become advisable and a moral obligation, since Long Beach would be providing an improved channel and an improved mouth for the river at a very great loss to herself.

D. E. HUGHES, *Assistant Engineer.*

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4 In addition to the commercial value of the channel proposed to connect Long Beach Harbor and Los Angeles Harbor, there is a military value which deserves some consideration. It is, however, upon the commercial value alone that I base my opinion that if floods are diverted from the harbor district, the connecting channel is worthy of construction by the Federal Government in cooperation with the local government.

5. If floods be not diverted, the cost of the channel will be greatly increased, due to required protection against silting, and at the same time the channel will become a menace to Los Angeles Harbor by affording an easy entrance thereto for floods, and the adjacent lands will be either unavailable or undesirable for industrial purposes. In short, if the floods be not diverted, I am of the opinion that the connecting channel is not worth constructing.

6. If the floods be diverted, the ocean entrance of Long Beach Harbor may become worthy of improvement hereafter by the United States as an important entrance to Los Angeles Harbor, as well as to Long Beach Harbor. At present the entrance is not worthy of such improvement. If the floods be not diverted, whether they pass to the ocean via this entrance or between it and Los Angeles Harbor, the entrance will not be worthy of improvement by the United States, for its utility will be purely local and will be lessened for all purposes.

7. In order that the extent and cost of the connecting channel may be determined, as well as an equitable division of its cost between the Government and local interests, if it be constructed, a survey will be necessary. Since it is believed that some means of diverting the floods will be adopted, and the connecting channel will be possible, I recommend that the survey be made.

8. There are no questions of water power or other matters not mentioned above related to the proposed improvement.

9. Commercial statistics (compiled from data furnished by the Chamber of Commerce of Long Beach).

Season of navigation, year 1914: Open entire year.

FREIGHT TRAFFIC.

Articles.	Amount in customary units.	Amount in short tons.	Estimated valuation
Lumber	10,565,956 feet b. m	17,610	$284,276
Laths	1,889,154 pieces	525	945
Shingles	6,227,250 pieces	1,238	1,712
Shakes	220,599 pieces	123	1,344
General merchandise	290,000 pounds	145	29,000
Oil	1,271 barrels	254	3,202
Fish	2,450 tons	2,450	147,000
Total		22,345	467,479

A total of 117 steamers, of 37,041 net tonnage, entered the harbor during the year. This is exclusive of fishing and pleasure boats and United States naval vessels.

R. R. RAYMOND,
Major, Corps of Engineers.

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[First indorsement.]

OFFICE DIVISION ENGINEER, PACIFIC DIVISION,
San Francisco, Cal., June 28, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

Concurring in the views expressed by the district officer.

THOS. H. REES,
Lieut. Col., Corps of Engineers,
Division Engineer.

[Third indorsement.]

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
July 13, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. For reasons stated herein, the board concurs with the district officer and the division engineer in recommending a survey in order to determine the extent and advisability of the improvement.

For the board.

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

SURVEY OF LONG BEACH HARBOR, CAL.

UNITED STATES ENGINEER OFFICE,
Los Angeles, Cal., August 3, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Survey of Long Beach Harbor, Cal.

1. The following report of survey of Long Beach Harbor is submitted in compliance with department letter dated July 16, 1915.

2. The extent of the survey contemplated is understood to be such as to determine the cost and the advisability of the channel proposed to connect Long Beach Harbor and Los Angeles Harbor.

3. No field work has been done for this survey as the ground was surveyed two years ago, the report of the survey being published (with map) in House Document No. 896, Sixty-third Congress, second session. This former survey has been checked by Mr. D. E. Hughes, assistant engineer, of this office, by comparison with data obtained by the city of Los Angeles at the westerly part and at the easterly part with levels run by Mr. Markle, of Long Beach. No indication of error was found.

4. The length of channel in the strip of land 400 feet wide already deeded to the United States is 6,800 feet, and the length of channel within the limits of the east basin, including extra dredging to ease the turns at the west end, is 4,900 feet.

5. Side slopes attained in former dredging, as steep as 1 on 3, appear to be satisfactory. This slope is therefore assumed for purposes of estimate.

6. The unit cost of dredging will be dependent upon several factors which can not be determined with certainty. Chief among these is

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the availability of plant. At the present time, and probably for the ensuing 12 months, plant will be available in the harbor. The Government dredge *San Pedro* will be available and is competent to do the work; but this dredge is not modern and will require a much longer time than a modern dredge. It is estimated that she can do the work for 8 cents per yard. It is thought, however, that the saving in time by using a modern dredge will make it advisable to do the work by contract at an estimated cost of 10 cents per yard.

7. The law contemplates the construction of a channel 600 feet wide and 30 feet deep. Assuming that one-half of the 1 foot overdepth usually allowed will be made, the estimate is as follows:

4,900 feet of channel in East Basin, 4,331,737 cubic yards, at 10 cents....	$433,174
6,800 feet of channel in 600-foot strip, 6,153,501 cubic yards, at 10 cents...	615,350
	1,048,524
Engineering and contingencies, 10 per cent.....	104,852
Total.....	1,153,376

8. If Long Beach contributes one-half of the cost of the channel in the 600-foot strip, which is the channel to connect the two harbors, the cost to the United States will be reduced to $814,934, of which $476,491 will be for improvement in the East Basin of Los Angeles Harbor and $338,443 will be for the connecting channel.

9. Such an expenditure at the present time is not justified by commerce in sight in the near future, although it can not be said with assurance that it will not be justified in the course of time. It has been calculated upon the assumption that the law contemplates the depth of 30 feet over the full width of cross section, so that the estimate given above is a maximum. In my opinion, as stated in the preliminary examination report, a bottom width of 400 feet will be ample, leaving side slopes 100 feet wide for the 600-foot channel. In this case bulkheads or wharves could be built along the property lines and the owners could be authorized to dredge in the side slopes to the depths desired by them, probably at most wharves to a depth less than 30 feet. Or such owners could be authorized under revocable permits to construct open-pile wharves out to the edge of the 400-foot fairway; for such structures would probably decay before the full bottom width of 600 feet will become necessary.

10. The estimated cost of the channel 30 feet deep, together with overdepth averaging one-half foot, and 400 feet wide at the bottom, is as follows:

4,900 feet of channel in East Basin, 3,097,663 cubic yards, at 10 cents.....	$309,766
6,800 feet of channel in 600-foot strip, 4,405,649 cubic yards, at 10 cents....	440,565
	750,331
Engineering and contingencies, 10 per cent.....	75,033
Total.....	825,364

11. If Long Beach contributes one-half of the cost of the connecting channel, the total cost to the United States will be reduced to $583,053, of which $340,743 will be for the improvement of Los Angeles Harbor and $242,310 will be for the connecting channel.

12. It is thought that even if the full bottom width of 600 feet should in time become necessary, the United States will have done all that can be expected in reason if it constructs and maintains a

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fairway 400 feet wide and 30 feet deep. The operations of commerce at the wharf front result in considerable sediment being swept or dropped into the water. Much closer supervision and policing of the wharves will be exercised by the local authorities if the maintenance of the adjacent waters is a charge upon local funds. This consideration, together with the fact that a fixed and uniform depth along the wharves is not always necessary, seems to indicate that it is preferable to have the United States maintain the channel only between channel lines placed some distance out from the wharves or bulkhead lines. Therefore a bottom width of 400 feet is thought to be the maximum that the United States should construct and maintain in the present case.

13. Since the only traffic through the inland waters between the two harbors at present is restricted by the size and depth of the existing channel to very small vessels, all consideration of the value of the enlarged channel must relate to the future growth of trade. It is the general conclusion of those who have studied the conditions, existing and prospective, in the two harbors that the connecting channel will become necessary, and in my opinion it is worthy of construction by the United States, with local cooperation, at the ultimate cost of $825,364.

14. It is clear, however, that a channel 400 feet wide and 30 feet deep will not be required for some years to come and that a preliminary step toward its construction, to permit the beginning of the anticipated commercial development, should be the construction of a through channel whose cross section shall be proportioned to the immediate use that will be made of it. It is thought that a channel 24 feet deep and 200 feet wide at bottom will afford every facility that can be utilized at the present time or in the immediate future. Such a channel is estimated to cost as follows, the unit price and overdepth being assumed as above:

4,900 feet of channel in East Basin, 1,443,500 cubic yards, at 10 cents	$144,350
6,800 feet of channel in 600-foot strip, 2,068,000 cubic yards, at 10 cents	206,800
	351,150
Engineering and contingencies	35,115
Total	386,265

15. If Long Beach contributes one-half of the cost of the connecting channel, the total cost to the United States will be reduced to $272,525, of which $158,785 will be for the improvement of Los Angeles Harbor and $113,740 will be for the connecting channel.

16. The contribution of Long Beach for the channel 400 feet wide at bottom, on the assumption that it will be one-half of the cost of the connecting channel, can be estimated to be $242,311. If this sum be contributed at the outset, the burden upon the United States for the construction of the 200-foot channel will be $143,954, which will be but little less than the cost of the channel in the East Basin. In other words, such a contribution on the part of Long Beach will be an assumption by that city of the entire risk of a failure of commerce to develop to an extent justifying the improvement. On the other hand, it will place the United States under the moral obligation to complete the 400-foot channel at the added cost of $439,099 as soon as the growth of commerce demands such an extension of

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facilities. This contingency, however, will arise only as an accomplished fact and the expenditure need never be made until fully justified. This justification, it is believed, will be merely a matter of time.

17. A connecting channel, as such, will be of no value until cut through, and its value for industrial developments along its course will be small unless its width be such as to permit vessels to lie at wharves on either side without interfering with through traffic. These considerations, taken with the lower unit cost of work done in large quantities, indicate that it will be wise to enter into the work with sufficient funds to complete a through channel of the minimum width of 200 feet.

18. If the construction of this channel be authorized, the rate of work will depend upon the number and capacities of the dredges employed. It is to be expected that not more than two dredges will be available and that the rate will be such as to require not less than nine months of actual dredging. It is improbable, therefore, that more funds will be required within the first fiscal year than the initial contribution of $242,300 from Long Beach.

19. It is recommended accordingly that the project for a channel 200 feet wide and 24 feet deep at mean low lower water be authorized, the work to be done by Government dredge or by continuing contract or contracts; but, in either case, that the initial appropriation of $144,000 be made available for the fiscal year following that in which the work is begun, upon the conditions that there be deeded to the United States without cost thereto sufficient land to comprise, with land heretofore deeded to the United States for the connecting channel, a strip 600 feet wide connecting the harbors of Los Angeles and Long Beach, and that there be deposited in the Treasury of the United States, or other depository approved by the Secretary of War, to the credit of the Secretary of War and to be applied to the construction of the connecting channel, the sum of $242,300.

20. There are no questions of water power involved. The problem of terminals is one that must be solved by the progressive development of the locality. The terminals in the two harbors whose connection is desired do not appear to require detailed description in this report. There are at both harbors ample public wharves, with rail and highway connections.

21. The question of freshets is vitally important. This matter has been outlined in the report of preliminary examination dated June 16, 1915, and has been discussed in greater detail in the report[1] dated January 2, 1915, of a survey for the protection of Los Angeles and Long Beach Harbors from silt deposit, required by the river and harbor act of July 25, 1912. The effect of freshets upon the connecting channel will be to obliterate it, and the existence of such a channel will be a source of danger to Los Angeles Harbor so long as the freshets are permitted to enter and cross the harbor district. If, however, freshets be diverted from the harbor district, as recommended in the report of survey above mentioned, the maintenance of the connecting channel will become so simple that it may be undertaken as a part of the general maintenance of the whole harbor without material increase of the estimate therefor, especially if only a fairway be maintained by the United States while the wharf front be main-

[1] See H. Doc No. 462, 64th Cong., 1st sess.

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tained by local authorities. In fact, if diversion be made, the maintenance of the whole harbor will become so small that it can not be well estimated until some actual experience shall have been had. If diversion be not made, the cost of maintenance will become prohibitive and the connecting channel will be unworthy of construction.

R. R. RAYMOND,
Major, Corps of Engineers.

[First indorsement.]

OFFICE DIVISION ENGINEER, PACIFIC DIVISION,
San Francisco, Cal., August 10, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. Apparently a final decision upon this matter must be deferred until the question of diverting floods and sediment from the inner channels of the harbor has been determined.

2. Meanwhile it may be well to consider the general subject of the future development of this harbor. The outer harbor is only partially protected by the existing breakwater and is subject to surge and undertow, which seriously disturb vessels lying at the outer wharves. A remedy for this has been proposed and reported upon in the shape of a new breakwater extending from a point near Deadmans Island toward the outer end of the present breakwater.

3. The jetties at the entrance to Long Beach Harbor are parallel, are too close together, and are too short. They permit the entrance and propagation of waves, with but little stilling effect, and their extension and maintenance will never produce satisfactory results even at large expense.

4. The proposed diversion of floods and sediment to Alamitos Bay involves doubtful questions and undoubted great expense.

5. The inside connecting channel between Long Beach and Wilmington Harbors is another item of large expense, running ultimately to over $1,000,000 when completed.

6. A comprehensive and complete solution of the above problems may be found in the extension of the outer breakwater system to include the entrance to Long Beach Harbor and to have at least two openings of about 2,000 feet each. This would provide a protected area sufficient to still the entering waves and undertow, would give the desired protected connection between Long Beach and San Pedro Harbors, would make the entire ocean frontage from Long Beach to San Pedro available for wharves and terminals, and would permit the floods to be discharged between the two harbors, where the sediment would build up the sloughs and marshes and ultimately the shoal water along the beach.

7. The cost of the outer breakwater and of controlling the floods within the desired area would be no greater than the cost of the several separate items mentioned above.

8. If there is no chance of this larger project receiving consideration, I would concur in the views expressed by the district engineer officer.

THOS. H. REES,
Lieut. Col., Corps of Engineers,
Division Engineer.

[For report of the Board of Engineers for Rivers and Harbors on survey, see p. 3.]

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SUPPLEMENTAL REPORT ON LONG BEACH HARBOR, CAL.

WAR DEPARTMENT,
UNITED STATES ENGINEER OFFICE,
Los Angeles, Cal., August 28, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Estimate for connecting channel.

1. In compliance with an oral request of the Board of Engineers for Rivers and Harbors, I submit the following estimate of cost of a channel 200 feet wide at bottom and 20 feet deep between Long Beach Harbor and Los Angeles Harbor. This is supplemental to my report of survey of Long Beach Harbor, Cal., dated August 3, 1915.

2. An allowance of one-half foot for overdepth has been made.

3. Estimate:

4,900 feet of channel in East Basin, 1,185,000 cubic yards, at 10 cents,	$118,500	
Engineering and contingencies, 10 per cent	11,850	
		$130,350
6,800 feet of channel in 600-foot strip, 1,705,000 cubic yards, at 10 cents	170,500	
Engineering and contingencies, 10 per cent	17,050	
		187,550
Total		317,900

4. If Long Beach contributes one-half of the cost of the connecting channel, the total cost to the United States will be reduced to $224,125 of which $130,350 will be for the improvement of Los Angeles Harbor and $93,775 will be for the connecting channel.

5. If Long Beach contributes the entire cost of the connecting channel 200 feet by 20 feet, with a view to ultimately contributing one-half of the cost of the connecting channel 400 feet by 30 feet, the present cost to the United States will be $130,350.

6. If Long Beach makes the contribution of $242,311 mentioned in paragraph 16 of the report of survey, the present cost to the United States will be $75,589, which should be appropriated so as to be available in the fiscal year following that in which the work is begun.

R. R. RAYMOND,
Major, Corps of Engineers.

[First indorsement.]

OFFICE DIVISION ENGINEER, PACIFIC DIVISION,
San Francisco, Cal., August 30, 1915.

To the Chief of Engineers, United States Army.

THOS. H. REES,
Lieut. Col., Corps of Engineers,
Division Engineer.

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LETTER OF LONG BEACH CHAMBER OF COMMERCE HARBOR COMMITTEE IN RE CONNECTING CHANNEL LOS ANGELES-LONG BEACH HARBOR.

LONG BEACH, CAL., *August 12, 1915.*

GENTLEMEN: The citizens of Long Beach believe the next step in the development of the Los Angeles-Long Beach Harbor should be the dredging of the channel connecting the San Pedro and Long Beach entrances, and at this time desire to direct your attention to the very important bearing this work will have on the future value to the United States Government of the Los Angeles-Long Beach Harbor, should you consider favorably the report just submitted by your district engineer, Maj. R. R. Raymond, Corps of Engineers.

It is truly our belief that from a military standpoint alone this channel when completed will be of sufficient service for use of the Government submarines, to warrant your earnest consideration and hearty approval, and to inspire you to take the necessary steps looking to the accomplishment of this particular feature of harbor development.

It goes without saying that this paramount appeal will receive at the hands of your board such treatment as the case justifies, but this being a commercial organization we have the honor to submit the following along commercial lines:

There has already been expended in the development of the Long Beach end of the harbor, in actual dredging work, the sum of $800,000, and in the building of jetties at the Long Beach entrance an amount in excess of $200,000, making the expenditures total more than $1,000,000. This has all been done without municipal, State, or Federal aid.

The city of Long Beach has acquired its own municipal docks of sufficient capacity to accommodate present demands, having at this time just completed the construction of an additional wharf along the west slip of its holdings. Manufacturing plants of some considerable importance have already been established at the Long Beach end of the harbor, chief among them being the Craig Shipbuilding Co.'s plant, which company is now completing the construction of two Government submarines under subcontract from the Lake Torpedo Boat Co. of Bridgeport, Conn.

While the Long Beach end of the harbor may not yet be commercialized to an extent that perhaps would warrant a large Government appropriation under present conditions, our citizens have evidenced sufficient faith in the future prospects of its becoming a great asset to the city of Long Beach, to vote bonds for harbor improvement to the extent of $525,000.

We, therefore, the harbor committee of the Long Beach Chamber of Commerce, in order to insure early action on your part, and to assure you of our belief that local cooperation will be promptly forthcoming along the lines suggested in Maj. Raymond's report, desire to state, if your Chief Engineer should adopt Maj. Raymond's report, and favorable action be taken by your honorable board, it is our belief that the city of Long Beach will undertake to provide funds to be expended under Government supervision on the basis indicated in the report.

Arrangements have already been made whereby a proper deed will be given, conveying to the United States Government an additional strip of land 200 feet wide, which will make the connecting channel the necessary 600 feet in width.

Awaiting with interest your favorable action to this most important feature in our harbor development,

Respectfully, yours,

P. E. HATCH,
Chairman Long Beach Chamber of Commerce Harbor Committee.

P. E. HATCH,
C. H. WINDHAM,
E. C. DENIO,
F. A. GREEN,
W. E. PRIVETT,
Members of Harbor Committee.

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

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64TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 461.

ARKANSAS RIVER, ARK. AND OKLA.

LETTER

FROM

THE SECRETARY OF WAR,

TRANSMITTING,

WITH A LETTER FROM THE CHIEF OF ENGINEERS, REPORT ON REEXAMINATION OF ARKANSAS RIVER, ARK. AND OKLA.

JANUARY 4, 1916.—Referred to the Committee on Rivers and Harbors and ordered to be printed.

WAR DEPARTMENT,
Washington, December 17, 1915.

The SPEAKER OF THE HOUSE OF REPRESENTATIVES.

SIR: I have the honor to transmit herewith a letter from the Chief of Engineers, United States Army, of this date, together with copy of a report from Maj. A. B. Putnam, Corps of Engineers, dated March 24, 1915, on reexamination of Arkansas River, Ark. and Okla., made by him in compliance with the provisions of the river and harbor act approved March 4, 1915.

Very respectfully,

LINDLEY M. GARRISON,
Secretary of War.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 17, 1915.

From: The Chief of Engineers, United States Army.
To: The Secretary of War.
Subject: Reexamination of Arkansas River, Ark. and Okla.

1. There is submitted herewith for transmission to Congress report dated March 24, 1915, by Maj. A. B. Putnam, Corps of Engineers, on reexamination of the project for improvement of Arkansas

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River, Ark. and Okla., directed by section 14 of the river and harbor act of March 4, 1915.

2. The Arkansas River has been under improvement by the United States since 1832, when snagging operations were inaugurated. The present project provides for improving the river from its mouth to the head of navigation by snagging operations, removing shoals by dredging and the use of contraction works, and holding the improved channel by revetment where necessary; the tentative use of two dredges on that part of the river between the mouth and Ozark, 318 miles; and the maintenance of existing works, including those at Pine Bluff, Ark. It was not expected that the operation of the two suction dredges between the mouth and Ozark would be able to maintain a navigable channel throughout that section, but these dredges were recommended for use in an experimental way to determine the practicability of improving the river by this method and at the same time to aid and encourage navigation. Experience has now demonstrated that no benefit commensurate with the cost can be expected from them, even if confined to the short reach below Pine Bluff, where they have been operated. The commerce has been decreasing and now amounts to only about 55,000 tons, a large part of which consists of forest products, which can usually be handled at medium and high stages without improvement. In view of the existing physical and commercial conditions the district officer thinks that the work of revetting the banks should be revived, and he recommends that the project be modified to provide for "the improvement of the river from its mouth to the mouth of Grand [Neosho] River (461 miles) by snagging operations, by revetting of banks, and by dredging operations with a view to producing at ordinary low water channel depths of 3½ feet to Little Rock, 3 feet from there to Ozark, 2½ feet from there to the mouth of the Canadian River, and 2 feet from there to the mouth of Neosho River." The division engineer calls attention to the general decline of commerce on the western rivers, and recommends that for the present all work of improvement on this river be confined to snagging, which work alone is justified by existing commerce.

3. This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated December 8, 1915. It lays special stress upon the small low water discharge of this river which prevents the formation of a channel giving commercial benefits commensurate with the cost of any radical improvement. The board concurs in the recommendation of the division engineer.

4. After due consideration of the above-mentioned reports, I concur in the views of the division engineer and the Board of Engineers for Rivers and Harbors, and therefore recommend that legislation be enacted modifying the existing project for improvement of Arkansas River, so as to limit the work to snagging the river from its mouth to the mouth of the Neosho, at an annual cost of about $35,000, and authorizing the transfer without charge of the dredges and other plant not required for snagging to such other works of improvement as the Chief of Engineers may designate.

DAN C. KINGMAN,
Chief of Engineers, United States Army.

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REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

[Third indorsement.]

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
December 8, 1915.

The CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. The following is in review of the district officer's report submitted under authority of section 14 of the river and harbor act of March 4, 1915, on reexamination of "Arkansas River, Ark. and Okla.," with a view of determining whether the adopted project shall be modified or the improvement abandoned.

2. The district officer reviews the history of the improvements which have been carried on from time to time under various projects since the inception of the work in 1832, when snagging was undertaken. Since that time much study by boards of engineers and by district officers has been given to the question of improving the river, and various methods have been tried involving snagging, dredging, bank protection, and contraction works.

3. The existing project provides for improvement from the mouth to Ozark, 318 miles, by the operation of two suction dredges; from the mouth to the head of navigation by snagging, dredging, and contraction works, holding the improved channel by revetment where necessary; and maintenance of works at Pine Bluff. No estimate of cost has been given. Under this and the various other projects described by the district officer, there had been expended to June 30, 1914, a total of $3,243,650.91. It is estimated that snagging will cost $35,000 annually and that it will require $118,700 annually for the operation of the two dredges.

4. It will be seen from a study of the history of this stream that little has been accomplished in the way of permanent improvement. The experimental operation of the dredges has demonstrated that only temporary benefit can be expected from them, even if confined to the short reach below Pine Bluff, and that several more dredges would be required on the reach now under improvement to secure anything like reliable navigation. Bank revetment and contraction works are of little benefit unless made practically continuous, and this would involve a much larger expenditure than would be justified by probable resulting advantages.

5. The commerce has been decreasing and now amounts to only about 55,000 tons, a large part of which consists of forest products, which can usually be handled at medium and high stages without improvement. Gradually the large vessels which formerly navigated this river have disappeared and the little business that is now done is by a few small boats operating over short distances.

6. The district officer believes that the improvement of the river should not be abandoned, but that more complete work of regulation should be undertaken and the project modified to read:

The improvement of the river from its mouth to the mouth of Grand (Neosho) River (461 miles) by snagging operations, by revetting of banks, and by dredging operations, with a view to producing at ordinary low water channel depths of 3½ feet to Little Rock, 3 feet from there to Ozark, 2½ feet from there to the mouth of the Canadian River, and 2 feet from there to the mouth of Neosho River.

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The division engineer calls attention to the general decline of commerce on the western rivers, including the trunk streams, and recommends that, for the present, all improvement on the Arkansas be confined to snagging, which is warranted by the existing commerce. He believes that dredging would be a waste of public funds.

7. As a result of notice to interested parties that abandonment of the project was under consideration, a request was made to the board for a public hearing. On account of the importance of the questions involved, this was given at Little Rock on November 16, 1915. A large number of persons were in attendance, including delegations from the principal cities above and below Little Rock.

8. On November 12 to 15 the board made a personal inspection of the lower 90 miles of the river, and on the latter date visited the bauxite mines situated about 22 miles from Little Rock. These mines have now an output of about 200,000 tons a year, which is shipped to East St. Louis. During the past year about 12,000 tons of this were handled by water, after rail shipment to Devall Bluff on the White River. Representatives of the bauxite corporation stated that it was their intention to establish a modern towboat and barge line between East St. Louis and some point on the Arkansas, White, or Mississippi Rivers to handle the aluminum ore, and on account of the shorter rail haul they would use the Arkansas River if it were effectively improved. The distances by rail from the bauxite mines to Little Rock on the Arkansas, Devall Bluff on the White, and Helena on the Mississippi, are 22, 69, and 134 miles, respectively. The corresponding water hauls to East St. Louis are 764, 722, and 496 miles, respectively. There is ample depth in the Mississippi, and there is also a greater depth now in the White River than can be obtained in the Arkansas River by open-river methods of improvement.

9. The Arkansas River flows through an alluvial bed, and the channel is subject to unusually rapid changes in position and depth. Its banks are easily eroded, and experience has shown that no permanent improvement of channel can be expected unless the banks are protected by revetment. This would necessitate practically continuous work on one or both banks, similar in character to that being done on the Missouri River under the existing project for that stream. Such work on the Missouri River costs from $50,000 to $60,000 per mile, and is expected to result in a channel depth of 6 feet or more. The permanent improvement of the Arkansas would be correspondingly expensive, and owing to the small low water discharge could hardly be expected to result in a low-water channel depth of more than about 3 feet, which would obviously be inadequate for a commerce great enough to justify such an expenditure.

10. The difficulty and great cost of permanently improving the Arkansas River led to the trial of the dredging project, as the commercial interests were considered of sufficient importance to justify the experiment in order to determine its utility on this stream and in the hope of receiving at least some temporary benefit and encouragement to navigation. The results attained are comparable to those secured by dredging on other streams when measured by length of channel dug in a given working time. They show that the two dredges in service, at an annual cost of $118,700 for operation,

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can not under ordinary conditions secure an improved channel even to Pine Bluff, and much less to Little Rock. The dredged channel fills rapidly with the sudden and uncertain changes in stage, and even if the number of dredges were increased at a correspondingly increase in cost, the results would still fall short of a dependable and satisfactory channel.

11. The board fully realizes the advantages of water transportation and the benefits that would result to a large section of the States of Arkansas and Oklahoma if a stable channel of good navigable depth were available. The physical conditions on this stream, however, and particularly its small low-water discharge, are such as to prevent any radical improvement except at a cost which is entirely disproportionate to resulting benefits, as far as they can now be foreseen. The removal of snags, at an estimated cost of $35,000 per year, will make the natural depths available and permit a light-draft navigation, such as has been carried on in the past. It is believed that this work should be continued.

12. In view of the foregoing, the board recommends legislation modifying the existing project so as to limit the work to snagging the river from its mouth to the Neosho, at an annual cost of about $35,000, and authorizing the transfer without charge of the dredges and other plant not required for snagging to such other improvement as the Chief of Engineers may designate.

For the board:

W. M. BLACK,
Colonel, Corps of Engineers,
Senior Member of the Board.

REEXAMINATION OF ARKANSAS RIVER, ARK. AND OKLA.

WAR DEARTMENT,
UNITED STATES ENGINEER OFFICE,
Little Rock, Ark., March 24, 1915.

From: The District Engineer Officer.
To: The Chief of Engineers, United States Army
(Through the Division Engineer).
Subject: Reexamination of project, Arkansas River, Ark. and Okla., directed by river and harbor act of March 4, 1915.

1. The following preliminary report upon a reexamination of the project for the improvement of Arkansas River, Ark. and Okla., is made, in compliance with instructions contained in your letter of the 18th instant.

2. This reexamination is ordered by the river and harbor act of March 4, 1915. The wording of the portion of the act applying to it is:

SEC. 14. That the following projects now under improvement shall be reexamined, in accordance with the law for the original examination of rivers and harbors, with a view to obtaining reports whether the adopted projects shall be modified or the improvement abandoned:

* * * * * * *

Arkansas River, Arkansas and Oklahoma.

* * * * * * *

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3. The adopted phraseology for expressing the existing project for the improvement of the Arkansas River is:

The improvement of the Arkansas River from its mouth to Ozark (318 miles) by operating two suction dredges; from its mouth to the head of navigation by snagging operations, by dredging operations, and by contraction works, holding the improved channel by revetment where necessary; and maintenance of works at Pine Bluff. No estimate of cost can be given.

4. Omitting many details and references, a brief general statement of the original projects and the changes in them which led to the existing project is: The first work done for the improvement of the Arkansas River was that of removing snags, etc., from the channel, a work inaugurated by act of July 3, 1832. This remained the means for improvement of the stream until by act of August 14, 1876, local improvement in the vicinity of Fort Smith was authorized. The limits for the snagging operations adopted by the act of July 3, 1832, were not stated in the act, but it seems that none were contemplated above Fort Smith, since the act of March 3, 1879, adopted a project for the improvement of the river from Fort Smith to Wichita, Kans., by snagging operations and the construction of slight wing dams at some of the worst shoals. In the following year the act of June 14, 1880, adopted a local project for the improvement of the river in the vicinity of Pine Bluff. Thus there were then four projects for the improvement of the Arkansas River, two local ones, Fort Smith and Pine Bluff, and two for snagging operations, one below Fort Smith, the other above Fort Smith. The first project contemplating permanent improvement of any extended portion of the river was that adopted by act of August 5, 1886, for the improvement of the river between Little Rock and the Mississippi River (174 miles) by means of permanent works to cost $2,538,544 and to give a channel depth of 6 feet at low water. The snagging operations continued under a separate project. In 1888 a board of engineers made an examination of the river and prepared a project for its improvement from the Mississippi River to the mouth of the Canadian River, 424 miles. The estimated cost of the proposed work was $16,360,000. The results to be obtained were 4 feet channel depth between the Mississippi River and Little Rock (174 miles) and 3 feet channel depth between Little Rock and Canadian River (250 miles). The project suggested by that board was not adopted, but by act of August 11, 1888, Congress adopted one of much larger scope, the project adopted by that act being:

Improving Arkansas River, Arkansas: Continuing improvement, $150,000: *Provided*, That nothing herein contained shall authorize the Secretary of War to enter upon project of improvement of said river as set forth in the report of the Board of Engineers on improvement of Arkansas River, from Wichita, Kans., to its mouth, dated New York City, March 16, 1888, and contained in House Executive Document No. 234, Fiftieth Congress, first session: *Provided*, That the Secretary of War shall expend the appropriation under this head with reference to the final improvement of this river as contemplated in the report of the Chief of Engineers for the year ending June 30, 1885, and as authorized in the act for the improvement of rivers and harbors, approved August 5, 1886, and in House Executive Document No. 90, Forty-ninth Congress, first session, said methods to be applied as the Secretary of War may direct at such points between Wichita, Kans., and the navigable mouth of the Arkansas River at its junction with the Mississippi River, as he may deem for the best interests of commerce. And all moneys now to the credit of different sections of the Arkansas River, other than the appropriations for the operating of the snag boats, shall be available for use under this head; and in

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the future the engineer in charge of this work and the Secretary of War shall make a report upon the progress and needs of this work under this head instead of reporting upon disconnected projects as heretofore. Nothing herein contained shall be understood to prevent the Secretary of War from applying any part or all funds previously appropriated for use at Fort Smith, Dardanelle, in Pine Bluff Reach, or from expending not exceeding $8,000 as a contingent fund for expenditure in Pine Bluff Reach.

This project covered 772 miles of river with no estimate of cost being given. The object sought was to obtain 6-foot channel depth below Little Rock, and 2-foot channel depth above that place. The snagging operations remained a separate project. Work under the project of August 11, 1888, was continued until 1898, when the district engineer officer reported that it was his opinion that it was impracticable to obtain the low-water depth of 6 feet below Little Rock as called for by the project. Following this, Congress, in the river and harbor act of March 3, 1899, authorized the President to appoint a board to examine the river and report such plan for its improvement as, in its opinion, was most feasible and which was best adapted to the necessities of commerce. The report of that board is printed in the annual report for 1901, pages 2128–2154. The project was not adopted by Congress, but in the following year, in the river and harbor act of June 13, 1902, the snagging operations were combined with the general improvement, making the one project cover all classes of work. The project was then stated:

The improvement of the river from its mouth to the head of navigation by snagging operations, by dredging operations, and by contraction works, holding the improved channel by revetment where necessary.

Although this project provided for the several classes of work, the general appropriations were reduced to an amount that provided for only a very limited amount of work outside of the snagging operations, until the act of June 25, 1910, made appropriation for the construction and operation of two suction dredges. This authorization arose from a combination of two reports by engineer boards. The first of these reports is a report on the Arkansas River up to Muskogee, printed in House Document 71, Sixty-first Congress, first session; the other is a report on Arkansas River between Little Rock and Ozark, printed in House Document No. 510, Sixty-first Congress, second session. The substance of these reports is that while the river could be improved to give low-water channel depths of about 4½ feet to Little Rock, about 3 feet to Fort Smith, and about 2 feet to the mouth of Grand River by means of permanent works, that the cost would be greater than the General Government would be justified in expending, and that in lieu of any attempt at permanent improvement only such temporary expedients should be used as would meet the urgent demands of commercial interests. While the snagging operations were recognized as necessary, they do not give any increase in channel depths. To give the increase in channel depths the Board of Engineers for Rivers and Harbors recommended the use of two suction dredges between the mouth of the river and Ozark. As Congress adopted the recommendation for the suction dredges, and in the same river and harbor bill authorized the maintenance of the works at Pine Bluff, the project for the improvement of this river then became the present project, as quoted in paragraph 3, but with the

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work being done under only three phases of it: First, snagging; second, dredging by two suction dredges; third, maintenance of works at Pine Bluff.

5. The Arkansas being a stream flowing in an unstable bed, no material improvement can be made in it as to channel depths until the banks are made permanent. The several plans and estimates that have been submitted by the several examining boards show that the permanent improvement of the river will be very costly. Dredging in alluvial streams is recognized as being a temporary expedient, and to be of any material benefit to navigation must be carried on on a large enough scale to give relief in a very short time over and throughout the portion of the river used during low-water season, for if one shoal remains to stop navigation the effect of that one shoal is as bad as if a dozen shoals existed at that time. As to the number of dredges that will be required in the Arkansas River, there is a great range in estimates. In the Annual Report of the Chief of Engineers for 1903, page 1410, et seq., there is an estimate made for the operation of dredges between the mouth of the river and Little Rock, 174 miles. Six dredges is stated as being the number needed for that section of the river. The Board of Engineers that made report upon the examination of the river from its mouth to Muskogee, 461 miles (H. Doc. No. 71, 61st Cong., 1st sess.), estimated that 5 dredges would be needed for that section of the river, but no definite statement was made as to how much channel could be actually maintained by them. In the report on the examination of the river from Little Rock to Ozark, 144 miles, a report printed in House Document No. 510, Sixty-first Congress, second session, estimate is made that for maintenance of channel by dredging alone 7 dredges will be necessary in that section, and that even then there will be interrupted navigation. Thus it is seen that while the district engineer officers estimated 13 dredges as the number needed to reasonably maintain the channels between the mouth of the river and Ozark, 318 miles, a board of engineers estimated 5 for the 461 miles between the mouth of the river and Muskogee. The final result was that the Board of Engineers for Rivers and Harbors recommended that 2 dredges be used between the mouth of the river and Ozark. It is not expected that these 2 will be able to maintain a navigation channel at all times throughout that section. The object in operating them is to determine the practicability of improving the river by this method and at the same time aid and encourage navigation.

In the calendar years 1907 and 1908 a 30-inch suction dredge was operated for three months. Its rate of progress in miles of channel dredged was 1.4 miles a month. Beginning with the middle of August, 1914, and ending the 1st of February, 1915, a 24-inch suction dredge was operated between the mouth of the river and Maddings, 91 miles. Maddings is 16 miles below Pine Bluff. In the first 72 miles from the mouth of the river, i. e., mouth to Williamette, there were 2.6 miles of dredging. In the 19 miles between Williamette and Maddings there were 6.1 miles of dredging, making a total of 8.7 miles dredged in 5½ months—a monthly average of 1.6 miles. The 16 miles of river between Maddings and Pine Bluff is practically

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the same as the 19 miles between Williamette and Maddings, so far as channel depths and character of channel are concerned. This indicates that had the dredge worked all the way through to Pine Bluff at least 5.1 more miles of dredging would have been needed, thus making 13.8 miles as the total dredging between the mouth of the river and Pine Bluff, or 9 months' work for a single dredge, or 4½ months for the 2 dredges now in the river. The effective channel depth left behind the dredge was 2½ feet at lowest water of the year for a boat 30 feet wide. The volume of flow was about 2,500 cubic feet a second at this time. Ahead of the dredge, i. e., upstream from the dredge, the controlling channel depths were 16 and 18 inches during the period of lowest water. From this statement of work accomplished it is seen that with only 2 dredges little relief can be given to navigation above Pine Bluff.

6. Fort Gibson, on the Neosho (Grand) River, 2 miles from its junction with the Arkansas River and 463 miles from the Mississippi River, is the head of navigation. In the pioneer days it was an important point for river commerce, and boats ran to that point at all times when there was sufficient channel depth in the river. The history of the decline of navigation throughout this river is the same as that on all the other western rivers, i. e., a gradual abandonment of the use of the river as the territory bordering it was supplied with railways. The order of abandonment in this river was—first, the abandonment of the Little Rock-Fort Smith packets, their trade being shortened to Little Rock and Shoal Creek; second, the abandonment of the Little Rock-Memphis packets, this trade being divided in two, Memphis-Pine Bluff, Pine Bluff-Little Rock; third, the abandonment of the Fort Smith-Fort Gibson packets, this being shortened to Fort Smith-Webbers Falls; and, finally, abandonment of all, the only attempt now at permanent packet lines being the Pine Bluff-Rosedale packet and the Pine Bluff-Adamsburg packet. There have been sporadic attempts to revive some of the lines. The last attempt of much importance was that made in 1909, when the Little Rock Packet Co. was organized for the avowed purpose of operating a packet line between Little Rock and Memphis and a combination packet and towboat line between Little Rock and Ozark. The line operated only a short while, and both of its boats have been sold. Just at present there is another attempt being made to revive the Little Rock-Memphis trade, the Little Rock Chamber of Commerce having entered a steamboat in this trade.

7. I have not available an analysis of the freight movement in the Arkansas Valley from which to determine the quantity that would be affected by dependable transportation lines on the Arkansas River. In the report upon the examination of the river between Little Rock and Ozark this was given as 608,000 tons for that 144 miles of river. Of this quantity 400,000 tons was coal. By using this as a basis, the assumption may be made that the total tonnage of freights that would be affected by dependable transportation lines on the Arkansas River from its mouth to Muskogee and Fort Gibson would be 675,000 tons of general freights and 600,000 tons of coal, making a total of 1,275,000 tons. The actual freight movement on

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the river during the 10-year period ending with the calendar year 1913 was:

Year.	Short tons.	Value.
1905 (ending May 31)	86,458	$1,636,920
1906 (ending May 31)	103,214	1,512,789
1907 (ending May 31)	104,593	2,192,531
1908 (ending May 31)	105,919	2,150,209
1909 (ending May 31)	92,455	2,122,105
1910 (ending May 31)	62,172	1,630,335
1910 (calendar year)	59,516	1,612,285
1911 (calendar year)	81,371	1,085,615
1912 (calendar year)	71,516	1,170,900
1913 (calendar year)	55,228	573,000

In all of these years the heaviest movement has been below Pine Bluff and about 80 per cent of it forest products. The commercial importance of the towns along the river as well as all of those in the entire valley is increasing all the time, although there is no index to this in the volume of traffic on the river.

8. From the time of the initial work on the river in 1832 to the close of the fiscal year ending June 30, 1914, the expenditures for the several classes of work, including all local projects with those of a general nature, have been:

For construction of permanent works	$1,018,511.93
For maintenance of those works	514,407.06
For snagging operations	1,349,284.67
For procuring and operating suction dredges	361,447.31
Total	3,243,650.97

9. As to whether the project should be modified or abandoned, I must report that it should not be abandoned. The snagging operations are the one necessity, for without them the natural depths of the stream are not available to navigation. They have to deal only with the continually recurring obstructions that come into the river by reason of caving banks, shifting of channels, and through forest débris brought into the main stream by tributaries during freshets. These operations do not increase channel depths as a rule, nor do they decrease the shifting of the channel. As related to the improvement of a river, they bear the same relations as a street sweeper does to a street, i. e., keep the highway clean. This means continuous operation with no change in physical conditions. These operations should not be abandoned, nor should they be curtailed. The standard estimate is $35,000 annually. Operation of suction dredges has not yet passed the experimental stage so far as this river is concerned. By "experimental stage" I mean the extent of work required to maintain a navigation channel over any fixed distance of river and the duration of time through which a dredged channel will remain effective.

Of course it is known in a general way that only about 60 per cent of the dredged channels will remain effective during one low-water period, that the first rise of any extent is liable to obliterate all dredged channels, and that the duration of a low stage is liable to many interruptions by small freshets of short duration. It is also known that under favorable conditions a suction dredge will average 1.5 miles of dredged channel 100 feet wide a month, and that the ratio of miles of dredging needed to miles of river to be covered is about as 1 to 25 in the portion of the river below Williamette and

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1 to 3 in the portion of the river above Williamette. Williamette is 72 miles from the Mississippi River. These ratios are based on the dredging needed to give a 3.5-foot channel at mean low water. Also in a general way it is known that the two dredges now provided for working this river can not maintain at all times that channel depth below Pine Bluff, 107 miles above the mouth of the river, and that even if their work be confined solely to that section there will be times that navigation will be interrupted by low water. Judging from the public utterances of the commercial bodies at Pine Bluff and Little Rock as to the results that are to be obtained by these two dredges, one must infer that those bodies are of the opinion that continuous navigation channels are to be provided through to Little Rock. When the general public comes to compare the statements issued by the commercial bodies with the actual results of the dredging operations there can not be other than disappointment. The approved estimate for operating these two dredges is $118,700 a year. I am not prepared to recommend that additional dredges be provided, for since caving banks are the cause of the need for the dredging it would seem that the logical thing to do is to remove the cause, and that dredging should be only a secondary step in the operations instead of the principal one for increasing channel depths.

10. I am not of the opinion that the improvement of the Arkansas River should be abandoned, but am inclined to the belief that the work of revetting the banks should be revived. The commercial importance of the valley is increasing all the time, as is natural under an increase of population. While this increase is not reflected in the river commerce, I can not hold that the absence of such reflection is an indication of the unworthiness of the improvement of the river.

11. In line with the foregoing, I must report that I think the project for the improvement of the river should be modified to read:

The improvement of the river from its mouth to the mouth of Grand River (461 miles) by snagging operation, by revetting of banks, and by dredging operations, with a view to producing at ordinary low water channel depths of 3½ feet to Little Rock, 3 feet from there to Ozark, 2½ feet from there to the mouth of the Canadian River, and 2 feet from there to the mouth of Neosho River.

A. B. PUTNAM,
Major, Corps of Engineers.

[First indorsement.]

OFFICE DIVISION ENGINEER, WESTERN DIVISION,
St. Louis, Mo., May 20, 1915.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY.

1. Forwarded.

2. Not only has the commerce of western rivers rapidly declined in recent years, as stated by the district officer, but the character of the boats carrying the traffic has radically changed. In 1900 the average sized boat that navigated the Arkansas River was one of 174 registered tons, while in 1913 it was only of 46 tons. In 1900 the larger vessels made trips from Little Rock and Pine Bluff to Memphis and Vicksburg, while in 1913 the average distance traveled was only 34 miles, indicating that the boat has entirely ceased competing with the railroad in carrying through traffic and is only used to collect the products of a farm distant from a railroad and transport them to the nearest rail connection. A similar condition is found on all the western rivers, with the exception of the transportation of coal

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on the Ohio River and a small movement of freight on the Missouri River between Kansas City and St. Louis. Such transportation has no effect on rail freight rates and can be most profitably carried by motor boats and barges of light draft.

3. Whatever may be the causes of this decline of river traffic, they are of general application to all the western rivers, and the density of traffic on the Arkansas River is so small that there is no probability that the improvement of its channel will counteract this general law, particularly since the radical improvement of the Mississippi River from St. Louis to New Orleans, which has existed for the past 10 years, has had no appreciable effect upon it.

4. Should a revival of river commerce occur, it will first be observed between large centers of population, such as Chicago, Pittsburgh, St. Louis, and New Orleans, where there are large amounts of manufactured articles to be moved. The agricultural products that are directly tributary to a river do not furnish a sufficient volume of freight to justify at present its permanent improvement as a route for through traffic, but a revival of commerce commencing at large centers of population along the trunk stream may gradually extend to the tributaries.

5. It is therefore recommended that the improvement of the Arkansas River be at present confined to snagging, which is warranted by the existing commerce, and that all attempts to permanently improve the river channel be deferred until there is an appreciable revival of commerce on the Mississippi River. The dredging proposed by the district officer is considered a waste of public funds. It can have no effect on the permanent improvement of the river. It is insufficient even to maintain a temporary channel from the river mouth to Pine Bluff. The transfer of the dredges built for the Arkansas River to the Ohio is suggested, where they would be of some practical use.

C. McD. TOWNSEND,
Colonel, Corps of Engineers,
Division Engineer.

[For report of the Board of Engineers for Rivers and Harbors, see p. 3.]

STATEMENT OF TRAFFIC BUREAU OF THE CHAMBER OF COMMERCE, PINE BLUFF, ARK.

Statement showing the present rail rates and the boat rates from river points to Pine Bluff, Ark.

From—	Class rates.							
	First class.		Second class.		Third class.		Fourth class.	
	Rail.	River.	Rail.	River.	Rail.	River.	Rail.	River.
Cincinnati, Ohio	$1.219	$0.75	$1.026	$0.65	$0.782	$0.50	$0.598	$0.40
Louisville, Ky	1.128	.75	.956	.65	.722	.50	.548	.40
St. Louis, Mo	1.00	.75	.85	.65	.65	.50	.49	.40
Memphis, Tenn	.78	.45	.60	.36	.45	.30	.36	.25

Freight moving from Cincinnati, Louisville, and St. Louis to Pine Bluff is handled by 3 boat lines, and from Memphis by 2 lines.

The above rates have been effective for only 1 year, and it will be noted that they are from 20 to 75 per cent lower than the rail rates.

The estimated saving to the Pine Bluff shippers during the past year on traffic from these points alone is $4,000, and the movement is doubling every few months.

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Statement comparing the class rates from St. Louis, Mo., to Pine Bluff and Little Rock, Ark., with the rates to various other points where the distance is the same or greater.

From—	Miles.	Class rates.										
		1	2	3	4	5	A	B	C	D	E	Tariffs.
		Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	
St. Louis to—												
Pine Bluff and Little Rock, Ark	358	100	85	65	49	37	39	32	27	23	18	1
Topeka, Kans	345	80	62	49	39	28	32	26	22	18	15	4
Emporia, Kans	392	96	74	58	46	37	42	33	26	21	16	4
Lincoln, Nebr	491	65	50	39	31	25	27½	22½	20	16½	14	4
St. Paul, Minn	576	63	52½	42	26	21	26	21	18	15	13½	5
Duluth, Minn	686	78	66	58	34	26	34	26	23	20	19	5
Mobile, Ala	806	90	75	65	50	40	.....	.....	.....	.....	.....	#
Pensacola, Fla	761	90	75	65	50	40	.....	.....	.....	.....	.....	#
New Orleans, La	701	90	75	65	50	40	.....	.....	.....	.....	.....	2
Chicago to—												
St. Paul, Minn	442	60	50	40	25	20	25	20	17	14	13	5
Kansas City, Mo	451	80	65	45	32	27	32	27	22	18½	16	3
Memphis, Tenn	535	85	65	55	43	37	.....	.....	.....	.....	.....	6
Mobile, Ala	866	110	90	75	58	47	.....	.....	.....	.....	.....	#
Pensacola, Fla	912	110	90	75	56	47	.....	.....	.....	.....	.....	#
Cincinnati to—												
Mobile, Ala	784	98	83	73	54	44	.....	.....	.....	.....	.....	#
New Orleans, La	923	98	83	73	54	44	.....	.....	.....	.....	.....	#
Pensacola, Fla	768	98	83	73	54	44	.....	.....	.....	.....	.....	#
Birmingham, Ala	506	89	79	68	55	47	.....	.....	.....	.....	.....	#
Louisville to—												
Montgomery, Ala	491	98	87	78	62	50	.....	.....	.....	.....	.....	#
Mobile, Ala	670	90	75	65	50	40	.....	.....	.....	.....	.....	#
New Orleans, La	809	90	75	65	50	40	.....	.....	.....	.....	.....	#
Pensacola, Fla	654	90	75	65	50	40	.....	.....	.....	.....	.....	1 #
New York to—												
Cincinnati, Ohio	750	65	57	44	30	26	.....	.....	.....	.....	.....	#
Louisville, Ky	850	75	65	50	35	30	.....	.....	.....	.....	.....	#
Evansville, Ind	987	83	72	55	39	33	.....	.....	.....	.....	.....	#
Paducah, Ky	1,092	90	78	60	42	36	.....	.....	.....	.....	.....	#
Memphis, Tenn	1,160	100	85	65	45	38	.....	.....	.....	.....	.....	#
Nashville, Tenn	1,047	91	78	60	42	36	.....	.....	.....	.....	.....	#
St. Paul to South Dakota	360	89	75	59	45	36	36	31	27	22	18	7
Iowa to—												
Kansas and Nebraska	360	86	72	57	43	34	34	30	26	22	17	8
State of Texas	360	80	72	60	58	44	46	40	34	23	17	9
State of Oklahoma	360	85	70	58	50	43	40	33	27	20	16	10
State of Arkansas	360	82	69	57	45	33	37	28½	24½	20½	16½	11

Tariffs used: 1, F. A. Leland's, S. W. L., I. C. C., 1058; 2, M. P. Washburn's, I. C. C., 119; 3, W. T. L., I. C. C., A602; 4, W. T. L., I. C. C., A494; 5, W. T. L., I. C. C., A422; 6, C. E. Fulton's, I. C. C., A108; 7, I. C. C. Decision 30, I. C. C., 663; 8, I. C. C. Decision 28, I. C. C., 198; 9, Railroad Commission of Texas rates; 10, Railroad Commission of Oklahoma rates; 11, Railroad Commission of Arkansas rates; #, I. C. C. Decision 30, I. C. C., 158.

Effect of water competition on rail rates at Memphis, Tenn., as against Pine Bluff and Little Rock, Ark.

	From—						
	Buffalo, N. Y.	Detroit, Mich.	Cleveland, Ohio.	Dayton, Ohio.	Cincinnati, Ohio.	Kansas City, Mo.	St. Louis, Mo.
Distance to—							
Memphis, Tenn.....miles..	815	782	756	548	494	484	305
Pine Bluff and Little Rock, miles.....	952	889	893	685	631	514	358
First class rate to—							
Memphis, Tenn.....	$0.91	$0.91	$0.91	$0.75	$0.75	$0.80	$0.65
Pine Bluff and Little Rock..	1.527	1.425	1.425	1.342	1.219	1.10	1.00
Rate per ton per mile to—							
Memphis, Tenn.....	.0223	.0242	.0241	.0274	.0304	.0331	.0426
Pine Bluff and Little Rock..	.0321	.0321	.0319	.0392	.0386	.0428	.0558
Rate per ton per mile to Memphis applied to mileage to Pine Bluff and Little Rock.....	1.062	1.076	1.075	.937	.958	.849	.763
Reducing present rate to Pine Bluff and Little Rock.....	.465	.35	.35	.405	.26	.251	.237
Saving per ton.....	$9.30	$7.00	$7.00	$8.10	$5.20	$5.02	$4.74

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LETTER OF TRAFFIC BUREAU OF THE CHAMBER OF COMMERCE, PINE BLUFF, ARK.

NOVEMBER 11, 1915.

GENTLEMEN: On October 1, 1914, the traffic bureau of the Chamber of Commerce of Pine Bluff, Ark., filed with the Interstate Commerce Commission a petition asking for the establishment of through river and rail rates from producing territory east of the Mississippi River to Pine Bluff, to be made by adding to the rail rates to Memphis, Tenn., the boat rates from Memphis to Pine Bluff.

This petition was filed only after a great deal of study and thought on the subject, and founded on the belief that its success would mean that a very great part of the present all-rail traffic would then move by river, giving to the consuming public the use of this natural avenue of commerce, which public interests demand should be utilized to the fullest extent, and naturally lowering the cost of transportation by reason of the movement by river.

Railroad competition undoubtedly has more to do with the falling off of river traffic than any one other factor, and Congress evidently had this in mind when it passed that part of the Panama Canal act that amended the act to regulate commerce and gave to the Interstate Commerce Commission the power to declare boat lines common carriers and to require them to join in with the all-rail carriers in the establishment of through rail-and-water rates. Since this authority has been granted the commission they have passed upon several petitions similar to ours, the most important of which are: Decatur Navigation Co. *v.* Louisville & Nashville Railroad Co., 31 I. C. C., 281; Chattanooga Packet Co. *v.* Illinois Central Railroad Co., 33 I. C. C., 384; Tampa Board of Trade *v.* Louisville & Nashville Railroad Co. et al., 30 I. C. C., 377; Bowling Green Business Men's Club *v.* Evansville & Bowling Green Packet Co. et al., 31 I. C. C., 301; Kansas City Missouri River Navigation Co. *v.* Chesapeake & Ohio Railway et al., 34 I. C. C., 67.

The favorable action by the commission in the above-named cases, where the circumstances and conditions were the same as in our case, prompted and influenced us in the filing of our petition.

Our case has been submitted to the commission after considerable expense and has been presented to them in oral argument at Washington, D. C.

Believing, as we do, that the commission will grant our request, as has been done in the other cases, we will have opened to us the natural artery of commerce and can use it as it has never been used before, moving those necessities of life that now move exclusively by rail partly by water at a reduction of possibly 20 per cent in freight charges and saving to the community served by Pine Bluff as a jobbing center a sum estimated at from $50,000 to $100,000 per year. But should the present work on the Arkansas River be stopped, we will be annihilated as a river point and our last attempt, based upon the law and believed to be the only way to restore the river traffic, will go for naught.

We ask you, therefore, to give this matter a very careful consideration in passing upon the continued improvement of the Arkansas River.

We attach hereto a copy of our petition to the Interstate Commerce Commission, together with statements of the rates now applying both by rail and water to Pine Bluff.

Submitted in behalf of the shippers and receivers of freight of Pine Bluff, Ark., who maintain the traffic bureau, by

Yours, truly,

W. M. TAYLOR, *Commissioner.*

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

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STATEMENT OF PINE BLUFF TRAFFIC BUREAU.

Before the Interstate Commerce Commission. Pine Bluff Traffic Bureau, petitioner, *v.* Louisville & Nashville Railroad Co.; Nashville, Chattanooga & St. Louis Railway; Southern Railway Co.; St. Louis & San Francisco Railroad Co. (James W. Lusk, W. B. Biddle, and W. C. Nixon, receivers); Mobile & Ohio Railroad Co.; Illinois Central Railroad Co.; The Baltimore & Ohio Southwestern Railroad Co.; The Baltimore & Ohio Railroad Co.; The Cleveland, Cincinnati, Chicago & St. Louis Railway Co.; Pennsylvania Co.; The Pennsylvania Railroad Co.; The Pittsburg, Cincinnati, Chicago & St. Louis Railway Co.; Erie Railroad Co.; The Cincinnati, Hamilton & Dayton Railway Co. (Judson Harmon and Rufus Smith, receivers); The Michigan Central Railroad Co.; Pere Marquette Railroad Co. (Dudley E. Waters, Frank W. Blair, and Paul H. King, receivers); Grand Trunk Western Railway Co.; Grand Trunk Railway Co. of Canada; The Wabash Railroad Co. (E. B. Pryor, receiver); Chicago & North Western Railway Co.; Chicago, Milwaukee & St. Paul Railway Co.; Memphis & Arkansas City Packet Co.; Pine Bluff & Rosedale Packet Co.; Lee Line Steamers; River & Rail Storage Co., respondents.

AMENDMENT TO PETITION.

Comes your petitioner and asks leave of the commission to amend its petition as follows, to wit:

That the petitioner is an auxiliary branch of the Chamber of Commerce of Pine Bluff, Ark., a corporation organized and existing under the laws of the State of Arkansas.

That in addition to the Memphis & Arkansas City Packet Co. and Pine Bluff & Rosedal Packet Co. the Lee Line Steamers are also common carriers, operating freight and passenger steamboats and freight barges between Memphis, Tenn., Arkansas City, Ark., and Rosedale, Miss., and other points.

That the River & Rail Storage Co. is a corporation under the laws of the State of Tennessee, located at Memphis, Tenn., with sidetrack and switching facilities connecting their warehouse and boat landing with every railroad line entering Memphis, Tenn., and have a physical connection between such railroad lines and packet steamboat and barge lines plying on the Mississippi River from Memphis south to Arkansas City, Ark., Rosedale, Miss., and other points.

Wherefore your petitioner prays, as in its original petition, that the said Lee Line Steamers and River & Rail Storage Co. be severally required to answer the charges herein; that the joint rates prayed for in the original petition be proportional rates; and that a physical connection be declared to exist between the railroads entering Memphis, Tenn., and the packet steamboat and barge lines above named.

PINE BLUFF TRAFFIC BUREAU,
By W. M. TAYLOR.

ROWELL & ALEXANDER, *Pine Bluff, Ark.*,
Attorneys for Petitioners.

Before the Interstate Commerce Commission. Pine Bluff Traffic Bureau, petitioner, *v.* Louisville & Nashville Railroad Co., Nashville, Chattanooga & St. Louis Railway, Southern Railway Co., St. Louis & San Francisco Railroad Co. (James W. Lusk, W. B. Biddle, and W. C. Nixon, receivers), Mobile & Ohio Railroad, Illinois Central Railroad Co., The Baltimore & Ohio Southwestern Railroad Co., The Baltimore & Ohio Railroad Co., The Cleveland, Cincinnati, Chicago & St. Louis Railway Co., Pennsylvania Co., Pennsylvania Railroad Co., The Pittsburgh, Cincinnati, Chicago & St. Louis Railway Co., Erie Railroad Co., Cincinnati, Hamilton & Dayton Railway Co. (Judson Harmon and Rufus Smith, receivers), Michigan Central Railroad Co., Pere Marquette Railroad (Dudley E. Waters, Frank W. Blair, and Paul H. King, receivers), Grand Trunk Railway System, Wabash Railroad (E. B. Pryor, receiver), Chicago North Western Railway Co., Chicago, Milwaukee & St. Paul Railway Co., Memphis & Arkansas City Packet Co., Pine Bluff & Rosedale Packet Co., respondents.

PETITION.

The petition of the above-named petitioner respectfully shows:

I. That the Pine Bluff Traffic Bureau is a voluntary organization of the receivers and shippers of freight of Pine Bluff, Ark., operated by and for their mutual protection in matters pertaining to rates and transportation.

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II. That the respondents above named are common carriers engaged in the transportation of passengers and property by railroad and by water between points in the States of New York, Pennsylvania, Ohio, Indiana, Michigan, Wisconsin, Minnesota, Illinois, Kentucky, West Virginia, Tennessee, Georgia, and Mississippi, and points in the State of Arkansas, and as such carriers are subject to the provisions of the act to regulate commerce approved February 4, 1887, and acts amendatory thereof and supplementary thereto.

III. That the respondent rail lines operate through routes and joint rates by rail from points of origin in the States named to Memphis, Tenn., and to Pine Bluff, Ark. (See Exhibits A and B for statement of rates from territories named.) That respondent water lines operate joint rates from Memphis, Tenn., to Pine Bluff, Ark., as follows: From Memphis to Rosedale, Miss., on the Mississippi River, via the Memphis & Arkansas City Packet Co.; from Rosedale, Miss., to Pine Bluff, Ark., on the Arkansas River, via the Pine Bluff & Rosedale Packet Co. (See Exhibit A for statement of through joint water rates.)

IV. That respondent rail lines operating into Memphis, Tenn., have been importuned with the request that they establish through routes and joint rates from points in the States mentioned in paragraph II to apply by rail to Memphis, Tenn., and thence by the Mississippi and Arkansas Rivers, Memphis to Pine Bluff, Ark., and that these rates be less per hundred pounds than the present through all-rail rates, as named in Exhibit A. No reply has been made to this request.

V. The Arkansas River is 1,600 miles long, and, next to the Missouri River, is the longest tributary of the Mississippi River. It has its source in the Rocky Mountains. After breaking through the Colorado canyons it flows through Kansas, Oklahoma, and cuts Arkansas into nearly equal parts, entering Arkansas at Fort Smith and emptying into the Mississippi River opposite Rosedale, Miss. In former years boats were operated upon it as far as Fort Smith, approximately 400 miles from its mouth, but of late years the operation of boats has gradually decreased in volume and distance until at the present time Pine Bluff, Ark., located approximately 110 miles from the mouth, is the head of navigation, and traffic has been kept up continuously from and to Pine Bluff, with the possible exception of one or two years. Reasons other than those of competition will be shown as a cause for the decrease in river traffic.

VI. At the present time the steamer *Lightwood*, a freight and passenger steamboat operated by the Pine Bluff & Rosedale Packet Co., operates approximately nine months in the year, carrying passengers and freight such as is tendered to it, and, with the Memphis & Arkansas City Packet Co., operating from Memphis to Rosedale, Miss., is able to meet all reasonable requirements of connecting railways with respect to security for freight charges, adequacy of service, efficiency of management, and any other guaranty which may justly and lawfully be required should this petition be granted.

VII. By reason of the facts set forth in the foregoing paragraphs, the petition request for establishment of through routes and joint rates not having been granted, they have been subjected to the payment of rates that are unduly discriminatory and in violation of section 3 of the act to regulate commerce.

Wherefore petitioner prays that respondents may be severally required to answer the charges herein, and after due hearing and investigation an order be made commanding said respondents, and each of them, to cease and desist from the aforesaid violation of said act to regulate commerce, and establish and put in force, and apply in the future, through routes and joint rates via rail and water lower than the present through all-rail rates from the points of origin shown in Exhibit A to Pine Bluff, Ark., this authority being vested in the commission as outlined in section 15 of the act to regulate commerce.

PINE BLUFF TRAFFIC BUREAU,
By W. M. TAYLOR, *Commissioner*.

Dated at Pine Bluff, Ark., October 1, 1914.

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EXHIBIT A.

Through all-rail class rates applying to Pine Bluff, Ark.—Western classification.

From—	Classes.									
	1	2	3	4	5	A	B	C	D	E
	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.
Atlanta-Knoxville	116	98	75	57	42	46	37	32	28	21
Birmingham-Chattanooga	110	93	71	54	40	43	35	30	26	20
Chicago, Ill	120	101	77	59	44	48	40	34	29	23
Cincinnati, Ohio	120	101	77	59	44	48	40	34	29	23
Dayton-South Bend, Ind	132	112	85	65	48	50	42	37	33	28
Des Moines	125	107	83	63	45	49	40	35	31	24
Detroit-Cleveland	140	130	92	68	53	55	46	39	35	29
Louisville, Ky	111	94	71	54	40	43	35	30	26	20
Macon	121	102	77	59	43	47	38	33	29	22
Milwaukee, Wis	120	101	77	59	44	48	40	34	29	23
Nashville, Tenn	106	90	69	52	39	42	34	29	25	19
Pittsburgh, Pa	150	130	97	72	56	59	48	43	39	33

Tariff reference: Leland's S. W. L. Tariff 45 J, I. C. C. 1017.
Water rates applying by boat from Memphis, Tenn., to Pine Bluff, Ark. Classes: 1, 45 cents; 2, 40 cents; 3, 30 cents; 4, 25 cents; 5, 25 cents.

EXHIBIT B.

All-rail rates in effect to Memphis, Tenn.—Southern classification.

From—	Note.	Classes.											
		1	2	3	4	5	6	A	B	C	D	E	H
		Cents per 100 lbs.	Cents pe. 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbr.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.	Cents per 100 lbs.
Chicago, Ill	C	85	65	55	43	37	31	21	32	21	18	25	50
Cincinnati, Ohio	A	75	60	55	40	35	30	20	30	17	24	49	
Cleveland, Ohio	B	91	70	59	46	39	33	23	34	23	20	27	53
Dayton, Ohio	B	75	60	55	40	35	30	20	31	30	17	24	49
Detroit, Mich	B	91	70	59	46	39	33	23	34	23	20	27	53
Louisville, Ky	A	65	50	45	35	30	25	15	26	15	12	20	42
Milwaukee, Wis	C	91	70	59	46	39	33	23	34	23	20	27	53
Nashville, Tenn	A	50	38	35	27	23	19	11	21	10	9	15	32
Pittsburgh, Pa	B	91	70	59	46	39	33	23	34	23	20	27	53
St. Paul, Minn	D	115	90	76	61	51	44	31	43	.....	.....	43	60
South Bend, Ind	B	85	65	55	43	37	31	21	33	21	18	25	57

Tariffs naming rates not available for Atlanta, Ga., Knoxville, Tenn., Birmingham, Ala., Chattanooga, Tenn., Macon, Ga.
Tariff references: A, Washburn's Mississippi River Points Tariff No. 6, I. C. C., 86; B, Eugene Morris's Tariff 15 H, I. C. C., 471; C, C. E. Fulton's Tariff 108 E, I. C. C., A 108; D, W. H. Hosmer's W. T. L. Tariff 80 A, I. C. C., A 421.

STATEMENT OF TRAFFIC BUREAU OF THE CHAMBER OF COMMERCE, PINE BLUFF, ARK.

Statement of the operations of the steamer *Lightwood.*—The steamboat *Lightwood* is owned and operated by the Pine Bluff & Rosedale Packet Co., John D. Crockett, president; D. H. Saunders, vice president; Joe C. Meyer, secretary and general manager. The *Lightwood* operates in the Arkansas River between Pine Bluff and Rosedale, Miss. She leaves Pine Bluff every Wednesday and Rosedale every Friday, making all necessary stops at landings on the river intermediate.

Tonnage handled by the "Lightwood" during the 12 months ending Oct. 31, 1915.

Commodity.	Tons.	Commodity.	Tons.	Commodity.	Tons.
Brick	12	Hay	100	Rice	1,600
Cotton	1,400	Lumber	600		
Cotton seed	1,000	Merchandise	4,588	Total	10,125
Cottonseed meal	15	Oats	180		
Corn	190	Potatoes	40		

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STATEMENT OF MR. C. L. HOLLAND.

The development of the inland waterways of this country are receiving more attention from the Government each year. Already large appropriations have been made by Congress and expended for the building of canals and improving of the principal streams and harbors of the Eastern and Central States east of the Mississippi River.

These people, realizing the great importance of and uses of their streams in the developing of manufacturing and mineral resources, have very properly seen to it that those water improvements have been made.

The streams west of the Mississippi River have received no attention until very recently. We are a new country—just a land of cotton and cattle. There was no need for river improvement, but conditions have changed. The Panama Canal has been built; the eyes of the world have been turned to the new South, to its limitless resources. The captains of industry are bringing the capital and skilled labor to develop them. The wheels of manufacturing and industry are beginning to hum, when but a little while ago the darky with his mule was attending his little cotton patch and the cowman rounded up his herd of wild cattle. But now great cities are growing; cow paths have given way to modern highways. It is but natural that the people living in the valley of the great Arkansas River should ask that the development of this stream be made to keep pace with the domestic improvements being made by them. My own State of Oklahoma has taken its place alongside of other Southern States; its citizens are cosmopolitan, realizing as they do the importance of the Arkansas River improvement, they may be counted upon to do their part toward getting them. Tulsa, for whom I am especially delegated to represent, is prepared to show as great if not a greater tonnage of freight for river commerce as any city on the Arkansas River. With 130 square miles of coal land having two veins of coal the thinnest of which will produce 3,500 tons to the acre, with great quantities of crude and refined oil, and almost limitless beds of shale, from which a very fine quality of brick is manufactured, and with the great oil-well supply houses and manufacturers of oil-well machinery you can readily understand why we have an immense tonnage of heavy freight that is asking for cheap water transportation. However, Tulsa does not come asking for the mere development of her section of the river, but they come asking for the improvement of the Arkansas River from its mouth to its head. They believe that all the citizens living in this great valley have a common interest. The facts and figures concerning the tonnage that Tulsa could furnish for commerce on the Arkansas River will be presented by my colleague.

I will now proceed to discuss another phase of river development:

Most of the statements and evidence submitted to you now and heretofore have been along the line of the improvement of the Arkansas River for the purpose of navigation. The proper improvement of this stream may serve another and even more important purpose than that of navigation, namely, water conservation. The Arkansas River is about 2,000 miles long and extends about equal length through the States of Colorado, Kansas, Oklahoma, and Arkansas. Some idea of its magnitude and importance may be had by consulting the new International Encyclopedia, volume 2, page 19. It says: "The Arkansas River, next to the Missouri, is the largest tributary of the Mississippi. It is about 2,000 miles long, is navigable for a distance of 650 miles from its mouth, and drains an area of 188,000 square miles." The statement that the Arkansas River is navigable for a distance of 650 miles from its mouth is of especial significance to Tulsa, because this city is only about 500 miles from its mouth and therefore is well within the limits of navigation.

The improvement of this river above Tulsa with a system of locks and dams is being advocated by people who have given this matter serious thought. Not only will the upper part be benefited by this great system, but the lower part as well. During the flood season these dams will gather large volumes of water and would greatly retard the swift onrush of the flood, so that the lower valleys of the Arkansas and Mississippi Rivers would not be suddenly overflowed, causing great damage to property.

It is estimated that the loss some years by a drought in the upper valley is about $30,000,000, and by floods in the lower valley $35,000,000, and that each year's loss would more than make the improvements necessary to prevent these calamities. By building dams at intervals along this stream, large reservoirs would be formed for storing water during the rainy season, and this water would evaporate into the air and form rain during the heated dry season.

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This would greatly benefit the growing crops in the upper valley, known as the western plains of Colorado, Kansas, and Oklahoma. The swift onrush of the flood would be held back by these dams, large volumes of water would be gathered, and the sudden overflow of the Mississippi and Arkansas Valleys would be prevented.

The United States engineers report that the average fall of the Arkansas River above Tulsa is about 2 feet to the mile. Estimating from this basis, the dams would be about 15 miles apart. The river is about 1,500 miles in length above Tulsa, therefore it would be necessary to build about 100 dams. The average width of the river is not to exceed 1,000 feet, therefore the dams would be about 1,000 feet long and 20 feet high. These locks and dams ought to be built at a cost approximating $15,000,000. Judging the allowance made by the Government for dredge boats on the lower Arkansas, there would be two boats for every 150 miles, or 20 boats, costing $200,000 each, or $4,000,000. Allowing $11,000,000 for other necessary material and labor to clear the channel, we believe the work could be completed for $30,000,000. These dredge boats would remove the sand from each side of the river, forming embankments to prevent the valley from flooding from high water.

These figures are based on reports which have been made from time to time by Government engineers, together with other well-known facts, and, while we do not pretend that they are accurate, yet they will serve to give an idea of what may be done by locks and dams to improve the great Arkansas River.

The United States Government is spending $40,000,000 to build a railroad in Alaska, and we believe that $30,000,000 spent upon the Arkansas River will do a great deal more good to the people of this country.

C. L. HOLLAND, *Tulsa, Okla.*

STATEMENT OF MR. E. N. ADAMS.

Mr. Holland, who has just preceded me, has given your honorable board an outline of the improvements that should be made on the Arkansas River, together with the purposes of said improvements, and I believe the same should receive your most earnest consideration. I have been delegated by the interests in Tulsa to present to this board statistics showing the annual amount of freight tonnage which is handled in and out of our city. Before going into this it might be well to give you some little information as to what kind of a city we have, also how the same has progressed during the last few years in the matter of population, and I also believe that the bank clearings enter a great deal into what a city is doing. In 1905 Tulsa had a population of 5,000, in 1910 we had a population of 18,182. During April, 1915, at the solicitation of the interests in Tulsa, through our chamber of commerce, the Federal Government took a census of our city, which showed a population of 28,240 within the corporate limits. We have numerous additions to our city, which are fairly well built up and are outside of the corporate limits, so that we firmly believe we have a population at the present time of not less than 37,000. The Tulsa Clearing House Association was formed in 1911, so we are unable to go back of that period. The bank clearing for the year 1911 amounted to $32,035,156 and for the 10 months ending October 31, 1915, $58,740,232. In the past and at present Tulsa is using gas and oil for manufacturing purposes and there seems to be no limit to either.

Tulsa and vicinity is underlaid with as high a grade of bituminous coal as will be found anywhere in the United States. The chemical analysis of this coal shows water, 4.78 per cent; volatile matter, 38.05 per cent; fixed carbon, 53.20 per cent; ash, 3.97 per cent. Sulphur, separately determined, 1.2¢ per cent; calorific value, 13,057 per cent British thermal units per pound. The vein is over 100 miles long and 25 miles wide. It commences in Rogers County at a point about 30 miles north and a little east of Tulsa and extends southwesterly through Tulsa to Henryetta. This vein of coal is almost inexhaustible and ranges from 2 to 3 feet thick. It is conservatively estimated that there are 80,000 acres of strip or shallow coal, which lies from 6 to 20 feet underneath the ground and can be stripped by teams and scrapers or steam shovels. The inexhaustible supply of coal lies from 60 to 250 feet underneath the ground. This strip coal will run close to 4,000 tons per acre. There are at present in Tulsa County four deep shaft mines in operation, and from the estimate given me they are now getting out between 25,000 and 30,000 tons of coal per month, and this is increasing right along. The chemical

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analysis shows this coal to be of very superior quality and is a free-burning bituminous hard coal, most excellent for domestic and steam purposes and is absolutely free from gas. You will very readily gather from this that Tulsa will be some day just what we claim, and that is she will be the manufacturing city in the State of Oklahoma.

Now, in regard to the amount of tonnage which has been handled in and out of Tulsa during the past year, we have been somewhat handicapped in getting this information together, as the business men in Tulsa are certainly a very busy class of people, and we have been able to secure this information from only 22 of our largest industries, and these figures only cover carload business with the exception of groceries, which include both carload and less-than-carload shipments. I have also prepared a statement showing a classified list of all of the receivers and shippers of freight in Tulsa, and I would like permission to file copies of both of these statements with this board.

In regard to the inbound tonnage we have handled during the past year—that is, the year ending October 31, 1915—16,616 tons of groceries, 3,000 tons of structural iron, 5,563 tons of bar iron, 6,531 tons of steel plates, 839 tons of galvanized iron, 667 tons of pig iron, 130 tons of plain and woven wire, 200 tons of barbed wire, 549 tons of coke and coal facings, 48 tons of boilers and machinery, 44 tons of pumps, 50 tons of paint, 29,394 tons of pipe and pipe fittings, 5,772 tons of oil-well supplies, and 1,853 tons of miscellaneous carload freight, which makes a grand total of 70,591 tons of freight which 22 concerns have received in Tulsa during the past year. As to the outbound freight, we have only taken the refined oil, and that does not begin to take in all of the refined oil which has moved out of Tulsa during the past year. Five concerns have shipped 462,290 tons of oil to points in the United States and 250,255 tons of oil was exported through the ports of New Orleans, La., and Port Arthur, Tex. I want to call particular attention to the fact that this tonnage moved in and out of Tulsa, Okla. Were we to include the tonnage for a radius of 50 miles, as was done by Kansas City, the amount we have shown would be a very small item. For instance, we have a very large development of oil in what is known as the Cushing field, which lies to the southwest of us, and it is estimated that during the last year and a half there has been shipped into this field alone approximately 10,000 cars of pipe, which would average nearly 100,000 pounds to the car, 4,000 cars of steel plates, which would average not less than 70,000 pounds per car, and about 5,000 cars of lumber, which will average about 45,000 pounds per car, this material all being used to build storage tanks for crude oil. If the Arkansas River was improved so that the same could be used for the transportation of freight, our coal business would have a wonderful development; and, as a matter of fact, river transportation would develop the State of Oklahoma, and it can not now be developed as it should with the high rate of transportation by rail, and it is taxing the facilities of the rail carriers to handle the business now offered.

E. N. ADAMS, *Tulsa, Okla.*

STATEMENT OF MR. E. N. ADAMS IN RE TULSA, OKLA.

Inbound freight:	Tons.
Groceries	16,616
Structural iron	3,000
Bar iron	5,563
Steel plates	6,531
Galvanized iron	839
Pig iron	667
Woven wire	100
Plain wire	30
Barbed wire	200
Coke	527
Coke facings	22
Boilers and machinery	48
Pumps	44
Paint	50
Pipe and pipe fittings	29,394
Oil-well supplies	5,772
Miscellaneous	1,853
Total	70,591

Outbound freight:	Tons.
Refined oil to points in the United States	462,290
Refined oil for export through the ports of New Orleans, La., and Port Arthur, Tex	250,255
Total	712,545

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Auto supplies.—American Auto Supply Co.; Brandle Motor Co.; Jeffrey Motor Salesroom; Motor Supply Co.; United States Tire Manufacturers; Western Auto Supply Co.

Automobiles.—Anderson Auto Agency; Automobile Sales Co.; Cadillac Co.; Dodge Bros. Motor Cars; Federal Motor Co.; Ford Co. of Tulsa; Hudson Motor Cars; Hupmobile Service Co.; K. C. Auto Co.; Maxwell Motor Co.; Midland Auto Co.; New State Auto Co.; Oldsmobile Co.; Overland Salesroom; Paige Motor Car Co.; Studebaker Car Agency; Tulsa Motor Car Co.; E. Westerman; Winton Auto Sales Co.

Awning and tent companies.—National Tent & Awning Co.

Belts.—Producers' Supply Co.

Boiler manufacturers.—Mount Cooper Boiler & Iron Co.

Boiler repair shops.—Horrigan Boiler Works.

Brick, tile, and cement companies.—Tulsa Brick Co.; Tulsa Vitrified Brick Co.

Building material.—Standard Roofing & Material Co.

Building supplies.—Builders Supply Co.

Cabinet manufacturers.—Tulsa Cabinet Manufacturing Co.

Carriage works.—Reedy Carriage Works.

China stores.—J. A. Harmuth China Co.

Cigars and tobacco.—William A. Burton (wholesale); Heyman Tobacco Co. (wholesale).

Clothing and furnishings.—Agee Clothing Co.; The Globe Clothing Co.; Golden Gate Store; Model Clothiers; Palace Clothiers; Phoenix; Plymouth Clothing Co.; Renberg Clothing Co.; A. Skuy; Paul A. Spitzer; Wright's Clothing.

Coal, wood, and fuel.—Canadian Coal Co.; Hickory Coal & Mining Co.; Marnet Mining Co.; Mohawk Coal Mining Co.; New State Coal Co.; Southwest Coal Co.; Tulsa Coal Co.; United Fuel Supply Co.

Commission companies.—Moore Commission Co.

Cone manufacturing companies.—Tulsa Cone Manufacturing Co.

Confectioners.—M. & B. Candy Co. (wholesale); J. A. Waldrep (wholesale).

Cotton and cotton oil companies.—Tulsa Cotton Oil Mill.

Decorators and painters.—Home Decorating Co.; Oklahoma Paint & Wall Paper Co.; Tulsa Decorating Co.

Drug stores.—Baker Drug Co.; Holmes & Hoover; Kendell Drug Co.; Quaker Drug Co.; The Rexall Drug Store; Shackle Drug Co.; Tulsa Drug Co.; Weaver Drug Co.; Younkman Red Cross Pharmacy.

Electrical supplies.—Brite Electrical Construction Co.; Deshon & Davison Electric Co.; Dodge Electric Co.; Electric Contracting Co.; Electric Storage Battery Service Co.; Electrical Supply Co.; Sand Springs Supply House; Southwestern Light Co.

Elevator companies.—Otis Elevator Co.

Explosives, dynamite.—Atlas Powder Co.

Feed, grain, and hay.—Arthur & McCune; A. H. & G. W. Sanders; J. O. Stewart; J. E. Thompson; Tulsa Feed Store; Wilcox & Son.

Fishing tool company.—Acme Fishing Tool Co.

Furniture companies.—Atherton Auction & Furniture Co.; Bargain Furniture Co.; Bass Furniture & Carpet Co.; Bowers Furniture Hospital; Bumgarner & Downing; Commission Furniture Co.; Diamond Furniture Co.; W. C. Farmer; Flack Furniture Co.; T. E. Genet; Jacobs Furniture Co.; Koons & Chastain; McPherson Furniture Co.; Miller Furniture Co.; North Side Furniture Co.; Oklahoma Auction Furniture Co.; Peoples Furniture Co.; Shannon Furniture Co.; Stanford Furniture Co.; Tulsa Household Supply Co.

Garment companies.—Tulsa Garment Manufacturing Co.; Tulsa Shirt Co.

Gas engine companies.—Bessemer Gas Engine Co.; Pattin Bros. Co.; Joseph Reid Gas Engine Co.

Gas meters.—Westcott & Greis.

Glass company.—Tulsa Glass Co.

Wholesale grocers.—Hale-Halsell Grocery Co.; Ratcliff-Sanders Grocer Co.; Upp Grocery Co.

Hardware.—E. E. Chartier, Ewing Hardware Co.; M. C. Hale; C. H. Justice; H. O. McClure; C. A. & W. F. Nichols Hardware Co.; Tulsa Hardware Co.

Hides and furs.—Tulsa Hide Co.

Horse and mule market.—R. A. Dunn.

Implements.—Lon R. Stansberry.

Iron works.—Hammond Iron Works; Oklahoma Iron Works.

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Junk companies.—Oil Field Supply Co.; Tulsa Junk & Bottle Co.; Tulsa Supply & Junk Co.

Light and power company.—Public Service Co.

Lithograph company.—Western Bank Supply Co.

Lumber companies.—T. J. Carter; H. R. Crews Lumber Co.; A. L. Davis Lumber Co.; Dickeson-Goodman Lumber Co.; S. M. Gloyd; H. E. Ketchan; Miller & Geck; Minnetonka Lumber Co.; Misener Lumber Yard; T. L. Neves; Robinson Lumber Co.; Rounds & Porter Lumber Co.; Turley Lumber Co.; Weber Lumber Co.

Machine shops.—Marion Machine Foundry; Pennsylvania Welding & Brazing Co.; Robinson Packer & Machine Co.

Manufacturers.—H. W. Johns Manville Co.; Tulsa Auto & Manufacturing Co.; Tulsa Boiler & Manufacturing Co.; Tulsa Machine & Tool Co.; Tulsa Manufacturing & Supply Co.; Tulsa Mattress Factory; Tulsa Rig-Reel & Manufacturing Co.

Mill and elevator company.—Rea-Read Mill & Elevator Co.

Music stores.—Allen & Theda; Darrow Music Co.; J. W. Jenkins Sons Music Co.; McMillion Piano Co.; Tulsa Music Co.

Newspapers, magazines, and periodicals.—Tulsa Daily Democrat; World Publishing Co.

Office supplies.—Oklahoma Safe & Fixture Co.

Oil and gas companies.—Oklahoma Oil Co.; Riverside Western Oil Co.; Southern Oil Corporation.

Oil well supply companies.—Anderson Manufacturing Co.; Atlas Supply Co.; Bovaird Supply Co.; Continental Supply Co.; John Finlayson Co.; Frick Reid Supply Co.; Jarecki Manufacturing Co.; McEwen Manufacturing Co.; National Supply Co.; Oil Field Supply Co.; Oil Well Improvements Co.; Producers Supply Co.; Republic Supply Co.; Swan Under-Reaming Co.; Western Rope & Cordage Co.; Western Supply Co.; Wire Rope Appliance Co.

Oil and gas companies.—Ardizzone & Ossenbeck; Arkansas River Bed Oil & Gas Co.; H. Y. Arnold; Frank Barnes; W. M. Black; Caney River Gas Co.; J. P. Cappeau Sons; Carter Oil Co.; E. Constantin Refinery; Craver & Co.; J. E. Crosbie; Devonian Oil Co.; Eastern Oil Co.; D. W. Franchot; Galbreath Gas Co.; E. N. Gillespie; Gladys Bell Oil Co.; Gypsey Oil Co.; Henry Oil Co.; Hill Oil & Gas Co.; Oscar R. Howard; J. A. Hull; Humble Oil Co.; R. A. Josey; Kathleen Oil Lease; E. R. Kemp; M. L. Lockwood; Los Angeles Cherokee Oil Co.; Mallory & Harris; March Oil Co.; John H. Markham; McMan Oil Co.; Millikin Oil Co.; Minshall & Co.; New York Oil Co.; W. C. Newell; Oklahoma Natural Gas Co.; Oklahoma Oil Producers Agency; Oklahoma State Oil Co.; Osage & Oklahoma Co.; Chas. Page; J. Edgar Pew; Pierce Oil Corporation; Prairie Oil & Gas Co.; Producers Oil Co.; E. A. Ross; Savoy Oil Co.; H. F. Sinclair; W. G. Skelley; H. Steinberger; C. E. Strouville; Texas Co.; Turley Oil Co.; Turnbuckle Oil Co.; Twin State Oil Co.; H. C. Tyrell; F. B. Ufer Oil & Gas Co.; Uncle Sam Oil Co.; Vensel & Elliott; Vicmar Oil Co.; Western Natural Gas Co.; C. J. Wrightsman; Harvey Young Oil Co.

Packing house companies.—Armour & Co.; Independent Packing Co.

Paints and wall paper.—Brown & Canfield; Oklahoma Paint & Wall Paper Co.; Plymouth Decorating Co.; St. Louis Wall Paper & Paint Co.; Tulsa Wholesale Paint & Glass Co.

Petroleum companies.—Cosden & Co.; Magnolia Petroleum Co.; Mid-Continent Petroleum Co.; Oklahoma Petroleum & Gasoline Co.; Roxana Petroleum Co.; Southwestern Petroleum Co.

Pipe-line companies.—Cosden Pipe Line Co.; Glen Pool Pipe Line Co.; Gulf Pipe Line Co.; Millikin Pipe Line Co.; Oklahoma Glazed Cement Pipe Co.; Prairie Pipe Line Co.

Plumbing and heating.—A. D. Plumbing Co.; J. C. Atkins; J. S. Bancroft; Curtis Plumbing Co.; Bell Plumbing Co.; Gillis Plumbing Co.; Geo. W. Groves; D. W. Holmes; F. S. Kelley; Knowles & Green; Herman Kramer; E. L. Lacour; R. C. Middleton; Mack Neer; J. H. Shipherd; Henry Stoffel; Tulsa Plumbing & Cornice Co.; Watt Plumbing Co.

Produce companies.—R. R. Allen; A. K. Dawson Produce Co.; Dreyfus Bros.; Farmers & Merchants Produce Co.; Goodner-Malone Co.; R. C. Mills Co.; Oklahoma Commission Co.; T. D. Turner & Co.; Winns Commission Co.

Pumps.—H. D. Cornell.

Pumping supplies.—Skinner Bros.

Refining companies.—Constantin Refining Co.; Cosden & Co.; Chelsea Refining Co.; Mid-Continent Refining Co.; National Refining Co.; Pan American Refining Co.; Phœnix Refining Co.; Pierce Oil Corporation.

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Sand and material companies.—O. K. Sand Co.; Price Sand Co.; Tulsa Sand Co.

Sash and doors.—Tulsa Cabinet Manufacturing Co.

Seed house.—Binding Stevens Seed Co.

Sewing machines.—Singer Sewing Machine Co.; Standard Sewing Machine Co.

Sheet-metal works.—Bell Sheet Metal Works; W. O. Moran; Southern Cornice Works; Stephens Sheet Metal Works; Tulsa Sheet Metal Co.; Wooldridge & Upton.

Stove company.—Queen Bee Stove Co.

Tank cars.—German American Car Co.

Tank manufacturers.—Black, Sivalls & Bryson; Maloney Tank Manufacturing Co.; Parkersburg Rig Reel Manufacturing Co.; Reeves Bros.; Standard Boiler & Plate Iron Co.; Warren City Tank & Boiler Co.

Tea and coffee company.—Hooper Bros.

Torpedo companies.—American Glycerine Co.; Central Torpedo Co.; Eastern Torpedo Co.; Independent Torpedo Co.; Kansas Torpedo Co.

Transfer and storage companies.—Nichols Transfer Co.; Page Transfer Co.: Tulsa-Red Ball Transfer Co.

Statement of Greater Muskogee Association.

From Memphis, Tenn.,[1] to—	Class and commodity rates from Memphis.										
		2	3	4	5	A	B	C	Agricultural implements.	Cement.	Lime.
	Cents per 100 lbs.	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*
Kansas City, Mo.	80	65	45	32	27	32	27	22	30	12½	.....
Joplin, Mo.	80	65	50	40	31	33	27½	22	.....	.....	.....
McAlester, Okla.	110	90	75	58	45	47	36½	30	47	27	20
Vinita, Okla.	101	83	73	55	43	45	36	27	39	20	20
Muskogee, Okla.	115	100	80	64	48	51	44	35	49	24	25

New Orleans, La.,[2] to—	Class.							
	1	2	3	4	5	A	B	C
	Cents per 100 lbs.	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*
Kansas City, Mo.	1.10	0.85	0.65	0.53	0.38	0.42	0.37	0.27
St. Joseph, Mo.								
Joplin, Mo.	1.10	.85	.65	.53	.38	.42	.37	.27
Muskogee, Okla.	1.35	1.18	.97	.90	.70	.74	.57	.45

New Orleans, La.,[2] to—	Bags, burlap, gunny, or jute; also burlaps.	Canned goods, fruit, vegetables, fish, soups, etc.	Shells, oyster.	Rice, bran chaff, hulls, and polish.	Coffee, green.	
					Carload.	Less than carload.
	Cents per 100 lbs.	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*
Kansas City, Mo.	[3]0.28	[3]0.38	[4]0.21	[5]0.22	[3]0.38	0.40
St. Joseph, Mo.						
Joplin, Mo.	.28	.38	.....	.....	[3].35	.40
Muskogee, Okla.	[3].45	[6].44	[4].35	[6].25	[3].39	[7].97

[1] Authority, Oklahoma Points. F. A. Leland's 15 Series. Kansas City, A. D. Hall 1-C. Joplin, West. Trunk Line 33-D.

[2] Authority: New Orleans Northwestern Tariff No. 4; Trans-Missouri Tariff 15-G; Southwestern Lines Tariff No. 50.

[3] Minimum weight, 30,000 pounds.

[4] Minimum weight, 40,000 pounds.

[5] Minimum weight, 24,000 pounds.

[6] Minimum weight, 36,000 pounds.

[7] Third class, single sacks.

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Statement of Greater Muskogee Association—Continued.

New Orleans, La.,[1] to—	Matting.	Rice, clean (carload).	Sugar (carload).	Molasses and sirup (except fountain or coloring sirup, including glucose sirup).	Molasses, low grade, in tank cars.	
					Imported value 8 cents per gallon or less.	Domestic value 8 cents per gallon or less.
	Cents per 100 lbs.	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*	*Cents per 100 lbs.*
Kansas City, Mo.	[2]0.88	[3]0.37	[4]0.32	[5]0.30	0.17	0.28
St. Joseph, Mo.						
Joplin, Mo.	.65	.37	[4].32	.30	.....	.....
Muskogee, Okla.	[6].97	[5].39	[4].35	[5].35	[5].25	[5].28

[1] Authority: New Orleans Northwestern Tariff No. 4; Trans-Missouri Tariff 15-G; Southwestern Lines Tariff No. 59

[2] Minimum weight, 24,000 pounds.
[3] Minimum weight, 30,000 pounds.
[4] Minimum weight, 33,000 pounds.
[5] Minimum weight, 40,000 pounds, except in tank cars.
[6] Third class, minimum weight 34,000 pounds.

Canned goods classification, New Orleans, La., to Muskogee, Okla.: Effective June 29, 1906, 48 cents; June 1, 1908, 51 cents; Jan. 10, 1909, 40 cents; Feb. 1, 1910, 39 cents; June 1, 1910, 44 cents. Present rates, 44 cents. Authority, Leland's 59 Series.

OUTBOUND TONNAGE.

Oil:		
Muskogee Refining Co	3,952	
Cudahy Refining Co., Muskogee plant	1,864	
Cudahy Refining Co., Coffeyville plant	3,108	
		8,924
Cotton, cottonseed products:		
Shippers Compress Co	15,000	
Muskogee Cotton Oil Mill	5,000	
		20,000
Potatoes, R. T. Payne & Co		2,150
Grains and grain products:		
New State Flour & Feed Co	4,000	
Oklahoma Seed Co	250	
Muskogee Roller Mill	240	
		4,490
Fruit and fruit products, Eagle Cider & Vinegar Co		180

RECAPITULATION.

	Tons.
Oil	8,924
Cotton, cottonseed products	20,000
Potatoes	2,150
Grains and grain products	4,490
Fruit and fruit products	180
Total	35,744

LETTER OF MUSKOGEE REFINING CO.

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIR: In reference to our telephone conversation of yesterday, regarding the amount of tonnage which could be diverted from railroad transportation companies to water route between Muskogee and New Orleans, beg to advise that our shipments in the past year have run from 5 to 30 cars per month, and we feel that 18 cars per month would strike a fair average of the entire year.

The shipments above mentioned consist of 75 barrels per car, or a gross weight of 30,750 pounds. You will readily understand that our shipments

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would be a great deal heavier if it were possible for us to again ship to Germany and Austria—two of our largest customers before the war.

Yours, very truly,

MUSKOGEE REFINING CO.,
By M. H. HART.

Mr. E. D. BEVITT,
Manager Retail Trade and Credit Bureau,
Greater Muskogee Association, Muskogee, Okla.

LETTER OF CUDAHY REFINING CO.

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIR: Complying with your request of recent date, will say that we are shipping from this point about 3,729,600 pounds of steam-refined oil to New Orleans per month.

Yours, very truly,

CUDAHY REFINING CO.,
By WILLIAM OWEN.

Mr. E. D. BEVITT, *Traffic Manager, Muskogee, Okla.*

LETTER OF CUDAHY REFINING CO.

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIR: Complying with your request of recent date will say that from our Coffeyville plant we are shipping to New Orleans about 6,216,000 pounds per month of oil for export.

We are using about 20,000 pounds of fuller's earth per month which we buy in Florida.

Yours, very truly,

CUDAHY REFINING CO.
WILLIAM OWEN.

Mr. E. D. BEVITT, *Traffic Manager,*
Muskogee, Okla.

LETTER OF SHIPPERS COMPRESS CO.

MUSKOGEE, OKLA., *November 13, 1915.*

DEAR SIR: Referring to your inquiry relative to the tonnage moving from this point yearly via New Orleans, beg to state that last season there was exported through this press 53,000 bales cotton and 24,000 moved via New Orleans. This proportion between the two Texas ports and New Orleans is increasing each year in favor of the latter.

So far this season New Orleans has received 90 per cent of all export cotton, and indications are that this will continue.

It is safe to say that this press will always handle 75,000 bales of cotton and generally 80 per cent is exported and that the present shows that New Orleans will handle 45,000 bales for this territory, all reshipped from here, or an annual tonnage of 11,000 tons.

Yours, truly,

J. C. FAHNESTOCK, *Superintendent.*

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF S. B. LOCKE & CO. (INC.).

MUSKOGEE, OKLA., *November 5, 1915.*

GENTLEMEN: Answering your letter of October 29 regarding our shipment and tonnage provided we could get water rate, will say that we believe we would ship 20,000 bales of cotton annually, provided we had steamers and water rate to the Gulf port.

Yours, very truly,

S. B. LOCKE & CO.,
By S. B. LOCKE.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

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LETTER OF MUSKOGEE COTTON OIL MILL.

MUSKOGEE, OKLA, *November 12, 1915.*

DEAR SIR: If the Arkansas River was made navigable, you could safely count on 5,000 tons per year from us, and perhaps more. The inbound tonnage would amount to at least 3,000 tons. As to the amount of outbound tonnage, would depend largely as to the direction our product was sold. The tonnage alone on cotton seed would be around 1,500 tons from Webber Falls, to say nothing about the cotton. To garner 1,500 tons cotton seed from Webber Falls would make 3,000 bales cotton that usually move from the above place. Nearly all our linters are either sold in Memphis or New Orleans; they could be very easily handled to these points if we had river navigation. We have three mills located right on the Arkansas River, Tulsa, Muskogee, and Fort Smith. Each mill will produce around 1,500 bales linters per year.

If the navigating of the Arkansas River could be made possible it would reclaim thousands of acres of land that are now practically idle, on account of overflowing of land that is now being partly cultivated. This alone is worth looking after.

You can count on us giving you all the assistance possible.

Yours, truly,

W. E. ABERNATHY, *Manager.*

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF R. T. PAYNE & CO.

MUSKOGEE, OKLA., *November 15, 1915.*

GENTLEMEN: If the Arkansas River had been navigable this fall it would have been possible to have moved 150 cars of potatoes on it. The minimum weight on potatoes is 30,000 pounds.

Yours, truly,

R. T. PAYNE & CO.,
By R. T. PAYNE.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF NEW STATE FLOUR & FEED CO.

MUSKOGEE, OKLA., *November 15, 1915.*

GENTLEMEN: With regard to tonnage that we could give the Arkansas River, were it navigable and with boat line operating to haul our commodities, we believe that we could ship grain and hay to Arkansas River points to the approximate amount of 4,000 tons per year.

This would include all towns along the river but mostly to Little Rock, Pine Bluff, Arkansas City, Helena, Memphis, Nashville, and to New Orleans.

Yours, truly,

NEW STATE FLOUR & FEED CO.,
M. A. MUNDING.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF OKLAHOMA SEED CO.

MUSKOGEE, OKLA., *November 13, 1915.*

DEAR SIR: If the Missouri River was navigable we could route shipments that way to the amount of from 200 to 300 tons annually.

Yours, very truly,

OKLAHOMA SEED CO.,
C. J. KOEPKE, *President.*

Mr. E. D. BEVITT, *City.*

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LETTER OF MUSKOGEE ROLLER MILLS.

MUSKOGEE, OKLA., *November 11, 1915.*

DEAR SIR: Under present business conditions the amount of tonnage which we could ship by the way of Arkansas River will amount to at least 40,000 pounds per month, and under conditions which would increase business at all this amount would undoubtedly be more than double.

Yours, truly,

MUSKOGEE ROLLER MILLS,
Per RALPH L. MOSIER.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF THE EAGLE CIDER & VINEGAR CO.

MUSKOGEE, OKLA., *November 15, 1915.*

DEAR SIR: Will state we could ship approximately, by Arkansas River, about 180 tons of merchandise such as cider, vinegar, apples, barrels, etc.

Very truly, yours,

EAGLE CIDER & VINEGAR CO.,
By S. G. FELIX.

E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

STATEMENT OF GREATER MUSKOGEE ASSOCIATION.

Tonnage statistics.

	Tons.	
Wholesale groceries:		
Muskogee Wholesale Grocer Co	12,000	
Chesnut-Biggons Grocer Co	8,400	
Jameson Grocery Co	7,500	
Dunlap Bros	4,232	
		32,132
Packing houses:		
Armour & Co	175	
Swift & Co	500	
		675
Dry goods:		
Graham-Sykes Co	125	
Pegram Dry Goods Co	100	
		225
Clothing:		
New Phoenix Clothing Co	65	
O. R. Clothing Co	15	
		80
Boots and shoes:		
Walk-Over Boot Shop	9	
Cash Shoe Store	10	
McKinney & Redd	14	
		33
Hardware:		
Hooker-Hendrix Hardware Co	1,000	
Atlas Supply Co	9,650	
Crane & Co	300	
L. A. Perkins Hardware Co	300	
Oklahoma Corrugated Steel & Iron Co	80	
Shirar & Copeland	125	
Maddin-Merchant Hardware Co	50	
Muskogee Hardware Co	20	
H. B. Davis Hardware Co	20	
		11,545

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	Tons	
Lumber:		
Geo. D. Hope Lumber Co	1,300	
Page Lumber Co	580	
H. E. Ketcham	1,051	
Marshall Lumber Co	1,750	
Minnetonka Lumber Co	1,250	
T. H. Rogers Lumber Co	500	
Muskogee Lumber Co	900	
J. A. Butts Lumber Co	900	
		8,21
Building material, paint, glass, wall paper, and fixtures:		
Standard Roofing & Material Co	50	
National Sash & Door Co	150	
The Craft Shop	1	
A. Fabbro & Co	150	
C. L. Dickman Glass Co	191	
Farrell Wall Paper Co	50	
Muskogee Marble & Granite Co	135	
Bockenheuser & Co	6	
Muskogee Paint & Glass Co	15	
R. E. Reed Paint & Wall Paper Co	37	
		78
Barbers' supplies, A. Halverson Co		3
Drugs, Cardinal Drug Co		1
Jewelers:		
H. L. Stern Jewelry Co	5	
Cohenour Rygel Co	2	
		7
Plumbing:		
The O'Connor Co	180	
Clyde C. Poole Plumbing Co	25	
		20
Harness and saddles:		
Thornton & Co	25	
O. S. Faylor	2	
R. B. Crittenden	5	
		3
Music houses:		
Kroh Music Co	120	
Jenkins' Sons Music Co	150	
		270
Furniture:		
E. F. Riley Furniture Co., now Riley-Harbour Furniture Co	80	
Household Furniture & Carpet Co	77	
Street-Eicholtz Furniture Co	150	
Ferguson Bros	100	
Todd Furniture Co	40	
Bewley Wholesale Furniture Co	22	
		469
Electric fixtures and wiring:		
Muskogee Electric Co	15	
Peabody Electric Co	50	
		65
Office supplies:		
Phoenix Office Supply Co	2	
Burroughs Adding Machine Co	17	
		19
Job printing, bookbinding, and supplies:		
Model Printing Co	5	
Phoenix Job Printing	15	
The Star Printing Co	1	
		21
Paper, news print, etc.:		
Adleta Paper Co	400	
The Muskogee Times Democrat Co	304	
Phoenix Printing Co	380	
		1,084

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Manufacturers:	Tons.
The Roberts Mattress Manufacturing Co.	468
Eagle Hay Press & Implement Co	90
Empire Fixture Works	70
Eagle Broom Co	3
J. C. Wynn	247
Wheat's Wood Workers	35
Muskogee Iron Works	1,000
Muskogee Tool Co	375
O. K. Sheet Metal Co	50
Muskogee Vehicle & Machinery Co	300
Muskogee Carriage & Automobile Works	20
Oklahoma Wagon Works	20
W. R. Lantz Carriage & Automobile Works	200
Shiff Cigar Co	1
	2,879

RECAPITULATION.

Wholesale groceries	32,132
Packing houses	675
Dry goods	225
Clothing	80
Boots and shoes	33
Hardware	11,545
Lumber	8,231
Building material	785
Barbers' supplies	36
Drugs	12
Jewelry	7
Plumbing	205
Harness and saddles	32
Music houses	270
Furniture	467
Electrical fixtures and wiring	65
Office supplies	19
Job printing, bookbinding, and supplies	21
Paper, news print, etc	1,004
Manufacturers	2,879
Total	58,725

LETTER OF MUSKOGEE WHOLESALE GROCER CO.

MUSKOGEE, OKLA., *November 8, 1915.*

DEAR SIR: We beg to advise that our tonnage for the past year amounted to about 20,000 tons, a large percentage of which could move via the Arkansas River were that stream navigable.

We cheerfully pledge ourselves to route every pound possible via any responsible boat line that operates on the river.

Yours truly,

MUSKOGEE WHOLESALE GROCER CO.,
By R. S. DAVIS,
President.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association.
Muskogee, Okla.

LETTER OF CHESNUTT-GIBBONS GROCER CO.

MUSKOGEE, OKLA., *November 11, 1915.*

DEAR SIR: We handle about 12,000 tons of freight per year and at least 60 per cent of it could be routed via the Arkansas River, provided that streams were open to navigation.

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We can assure you that we would do everything in our power to assist any responsible boat line operating on the river, as we believe that the improvement and navigation of the Arkansas River is essential to the future development of this section of the country.

Yours truly,

CHESNUTT-GIBBONS GROCER CO.,
H. M. CHESNUTT,
President.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association.
Muskogee, Okla.

LETTER OF JAMESON GROCERY CO.

MUSKOGEE, OKLA., *November 10, 1915.*

DEAR SIR: In reply to your letter of November 3 in reference to Arkansas River navigation, while we hardly understand just what tonnage you would wish to include in that, beg to say that, based on our past year's shipments, we handle about 8,000 to 10,000 tons annually. A very large portion of this would be available for river transportation.

We might further add that as we are contemplating opening a branch house in Little Rock the coming year, we would have about the same amount additional for that place.

Very respectfully,

JAMESON GROCERY CO.,
Per O. JAMESON,

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

STATEMENT OF DUNLAP BROS.

	Pounds
150 cars flour, 40,000 pounds each	6,000,000
Sugar, 10 cars, 60,000 pounds each	600,000
Coffee	125,000
5 carloads canned goods, 40,000 pounds each	200,000
10 cars sirup, 40,000 pounds each	400,000
Meat and lard	400,000
Other groceries	500,000
Hosiery, notions, etc	80,000
D. G. shoes, clothing, etc., in retail store	160,000

DUNLAP BROS.,
By IRA G. DUNLAP.

LETTER OF ARMOUR & CO.

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIR: Confirming our phone conversation to-day, will state that in case the Arkansas River is navigable we can figure on approximately 250,000 pounds by water annually. And in case shipments from Pacific coast can be brought in by way of Panama Canal it would mean a total tonnage of 350,000 pounds annually.

Yours, truly,

ARMOUR & CO.,
O. O. SWARTS.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF SWIFT & CO.

MUSKOGEE, OKLA., *November 13, 1915.*

GENTLEMEN: Basing our estimate on our October business, would say that it would be possible for us to ship about 1,000,000 pounds of nonperishable products via the proposed Arkansas River route.

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Our Chicago shipments during the month in question consisted of two cars of soap, one car evaporated milk, and one car of pickles and condiments.

Yours, respectfully,

SWIFT & CO.

GREATER MUSKOGEE ASSOCIATION,
Traffic Department, Muskogee, Okla.

LETTER OF GRAHAM-SYKES CO.

MUSKOGEE, OKLA., *November 11, 1915.*

DEAR MR. BEVITT: Replying to your request for us to furnish you with information as to the probable amount of tonnage that might be diverted for transportation via Arkansas River, will say that it is difficult for us to determine the exact amount.

In checking our October expense bills, and estimating that month as a fair comparison for the year, we find that shipments that could be diverted via Arkansas River are conservatively estimated at 100 to 150 tons per annum.

Yours, very truly,

GRAHAM-SYKES CO.,
By O. T. GRAHAM.

Mr. E. D. BEVITT,
Manager Traffic Department Greater Muskogee Association,
Muskogee, Okla.

LETTER OF PEGRAM DRY GOODS CO.

MUSKOGEE, OKLA., *November 12, 1915.*

GENTLEMEN: We have been interviewed on the subject of the navigation of the Arkansas River, with the request to state the possibility of shipments by water from St. Louis, Chicago, and other points via New Orleans to Muskogee through the Arkansas River. We believe it would be possible for us to ship a great many tons of freight during a year if this navigation were open, providing the rates were sufficiently less to justify such routing. Just how many tons it would be hard to estimate, but we should say in the neighborhood of 100 tons annually.

Trusting this undertaking may be satisfactorily carried out, we remain,

Yours, respectfully,

PEGRAM DRY GOODS CO.,
By T. L. PEGRAM.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF NEW PHOENIX CLOTHING CO.

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIR: If the Arkansas River was open to navigation it would be possible for us to route about 65 tons per year by the boat line operating thereon.

We trust the improvement of this stream will be carried out and we will be glad to ship every pound that we can that way.

Yours, very truly,

NEW PHOENIX CLOTHING CO.

Mr. E. D. BEVITT.
Manager Traffic Department Greater Muskogee Association,
Muskogee, Okla.

LETTER OF WALK-OVER BOOT SHOP.

MUSKOGEE, OKLA., *November 15, 1915.*

DEAR SIR: Our freight from Boston on shoes will run about 18,000 pounds; amount, $350.80.

Yours, respectfully,

WALK-OVER BOOT SHOP.
J. E. BUEHUSEN.

Mr. E. D. BEVITT,
Muskogee, Okla.

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LETTER OF CASH SHOE CO.

MUSKOGEE, OKLA., *November 15, 1915.*

GENTLEMEN: If the Arkansas River were navigable, it would be possible for us to route at least 10 tons per year.

Yours, truly,

CASH SHOE STORE,
By LOUIE D. GRIFFING.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF M'KINNEY & REDD.

MUSKOGEE, OKLA., *November 15, 1915.*

GENTLEMEN: If the Arkansas River were navigable, it would be possible for us to ship about 14 tons of freight annually.

McKINNEY & REDD.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF HOOKER-HENDRIX HARDWARE CO. (INC.).

MUSKOGEE, OKLA., *November 4, 1915.*

DEAR SIR: In reply to yours of November 3 will say that the approximate estimate of the river tonnage that we would give to the Arkansas River navigation from all points would be at least 1,000 tons for a period of 12 months.

Yours, truly,

HOOKER-HENDRIX HARDWARE CO.,
W. H. HOOKER.

E. D. BEVITT,
Manager Traffic Bureau, Muskogee, Okla.

LETTER OF ATLAS SUPPLY CO.

MUSKOGEE, OKLA., *November 10, 1915.*

DEAR SIR: Replying to your favor of November 3, requesting the approximate amount of tonnage available for transportation based on a commercial proposition, that could be transported by water if navigation was open in the Arkansas River to this point, we have been unable to go into this matter in detail so far as local shipments are concerned, but find in figuring up our carload shipments for Muskogee proper and deliveries in immediate territory that we have handled soil pipe and cast iron first nine months this year about the following tonnage: From Chattanooga, 75 to 100 tons; from Birmingham, 75 to 100 tons; from originating and Pittsburgh district, about 9,500 tons.

All of these figures, as stated above, are based on our records up to and including October.

Trust that this information will answer your purpose, and if necessary will be glad to give you a more detailed statement.

Yours, truly,

J. H. McDONALD.
President.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association.
Muskogee, Okla.

LETTER OF CRANE CO.

CHICAGO, ILL., *November 9, 1915.*

DEAR SIR: Replying to your letter of the 5th instant. Our business is of such a nature and comes from such points that no very large quantity of it can be handled via the Arkansas River. However, we could give to a line of boats running on the Arkansas in connection with the Mississippi River freight to

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the amount of 300 to 325 tons a year. Of course the rates would have to be low enough to justify using boats as against the better and quicker service by the railroad carriers.

Yours, truly,

CRANE CO.,
By O. F. BELL,
Traffic Manager.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF L. A. PERKINS HARDWARE CO.

MUSKOGEE, OKLA., *November 15, 1915.*

DEAR SIR: Replying to your inquiry concerning the amount of tonnage we could give the Arkansas River were that stream opened to navigation, we will say that we could give about 300 tons.

Very truly, yours,

L. A. PERKINS HARDWARE CO.,
By L. A. PERKINS.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF OKLAHOMA CORRUGATED STEEL & IRON CO. (INC.).

MUSKOGEE, OKLA., *November 11, 1915.*

DEAR SIR: Our average yearly tonnage into Muskogee amounts to about 100 tons. If the Arkansas River were navigable, we would gladly route most of this via the river.

Very truly, yours,

OKLAHOMA CORRUGATED STEEL & IRON CO.
H. C. EISENSCHMIDT, *Treasurer.*

E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF SHIRAR & COPELAND.

MUSKOGEE, OKLA., *November 12, 1915.*

GENTLEMEN: If the Arkansas River were open to navigation, it would be possible for us to route about 125 tons via the river.

We would be very glad to see the river improved, so that we could use it.

Yours, truly,

SHIRAR & COPELAND.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETER OF MADDIN-MERCHANT HARDWARE CO.

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIR: Replying to yours of recent date regarding tonnage which could be shipped to us by way of river, we believe a conservative estimate would be about 50 tons per year.

Yours, very truly,

MADDIN-MERCHANT HARDWARE CO.

Mr. E. D. BEVITT, *Muskogee, Okla.*

LETTER OF THE MUSKOGEE HARDWARE CO. (INC.).

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIR: If the Arkansas River was navigable, it would be possible for us to ship via the boat lines operating thereon about 20 tons per month.

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We hope that the improvement of the Arkansas River will not be abandoned, as we regard it as essential to the future development of this country.

Yours, truly,

MUSKOGEE HARDWARE CO.,
By J. T. LANGHMAN,
Secretary-Treasurer.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF H. B. DAVIS HARDWARE CO.

MUSKOGEE, OKLA., *November 13, 1915.*

DEAR SIR: Complying with your request for an estimate of the tonnage we could give in the event the Arkansas River was made navigable, I have made estimates on the basis of last year's business and believe that under ordinary conditions we could use such transportation to the amount of 40,000 pounds. This would consist mostly of wire and steel from the Atlantic coast.

This is, of course, only an estimate, but is as accurate as we could get at it.

Respectfully,

H. B. DAVIS HARDWARE CO.

Mr. W. S. RADAKER,
Secretary Greater Muskogee Association,
Muskogee, Okla.

LETTER OF THE O'CONNOR CO.

MUSKOGEE, OKLA., *November 13, 1915.*

DEAR SIR: Replying to your inquiry as to the amount of tonnage that we could give the Arkansas River were that stream open to navigation, will say that we could give about 360,000 pounds per year.

Very truly, yours,

THE O'CONNOR CO.,
By L. A. COBY, *Secretary.*

Mr. E. D. BEVITT, *Muskogee, Okla.*

LETTER OF CLYDE C. POOLE PLUMBING CO.

MUSKOGEE, OKLA., *November 13, 1915.*

SIR: In reply to your inquiry concerning the amount of tonnage I could give to the Arkansas River were it open to navigation, will say that I could probably furnish 25 tons per year or more.

Respectfully,

CLYDE C. POOLE PLUMBING CO.,
Per CLYDE C. POOLE, *Manager.*

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF MR. R. B. CRITTENDEN.

MUSKOGEE, OKLA., *November 13, 1915.*

DEAR SIR: Replying to your inquiry as to the amount of tonnage I could give the Arkansas River were it open to navigation and boat lines established, will say that I could route about 5 tons per year by river.

Yours, truly,

R. B. CRITTENDEN.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

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LETTER OF MR. O. S. FAYLOR.

MUSKOGEE, OKLA., *November 15, 1915.*

GENTLEMEN: I could route something like 2 tons of freight a year if the Arkansas River was navigable and would give us a better freight rate.

Yours, truly,

O. S. FAYLOR.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF THORNTON & CO.

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIR: If the Arkansas River were navigable, it would be possible for us to ship via the boat lines operating thereon about 25 tons per year.

We regard the navigation of the Arkansas River as of vital importance to the future development of this country.

Yours, truly,

THORNTON & CO.,
By G. W. COX, *Manager.*

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF J. W. JENKINS'S SONS MUSIC CO.

KANSAS CITY, MO., *November 12, 1915.*

DEAR SIR: We note yours of late date. It will be impossible for us to say what goods we could give you at Muskogee excepting we knew at what point the goods could be turned over to the river line and the probable service. If we could depend on a three weeks' service from New York, Boston, or Chicago, it is possible that we could give 150 or 200 tons of business per year. That is about as near as we could come to making you a proposition in the matter.

Yours, sincerely,

J. W. JENKINS'S SONS MUSIC CO.,
J. W. JENKINS, *President.*

Mr. E. D. BEVITT,
Greater Muskogee Association, Muskogee, Okla.

LETTER OF KROH MUSIC CO.

MUSKOGEE, OKLA., *November 15, 1915.*

GENTLEMEN: If the Arkansas River were navigable, it would be possible for us to route about 120 tons per year that way.

Yours, truly,

KROH MUSIC CO.,
By H. A. KROH.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF RILEY-HARBOUR FURNITURE CO.

MUSKOGEE, OKLA., *November 11, 1915.*

DEAR SIR: If the Arkansas River were navigable, it would be possible for us to route about 80 tons per annum via boat lines thereon.

We would be glad to see the river improved so that we could ship that way.

Yours, truly,

RILEY-HARBOUR FURNITURE CO.,
By E. F. RILEY.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

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LETTER OF THE HOUSEHOLD FURNITURE & CARPET CO.

MUSKOGEE, OKLA., *November 13, 1915.*

DEAR SIR: Replying to yours of the 9th instant, with reference to the tonnage on shipments that we will be in a position to give if the river were navigable, wish to say that we feel that our tonnage would run between 75 and 80 tons that we will be in a position to route that way.

We feel that this is a good move and hope to see, some time in the near future, boats running to Muskogee.

Yours, very truly,

T. O. BASS FURNITURE CO.,
T. O. BASS.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF STREET EICHOLTZ FURNITURE CO.

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIR: In figuring up our freight weights for the past year we find we have received about 195 tons; of course, the greater part of this could be routed via river if shipping facilities were established.

Hoping we have given you the desired information, we are,

Yours, very truly,

STREET EICHOLTZ FURNITURE CO.
By W. M. EICHOLTZ.

Mr. E. D. BEVITT,
Traffic Manager, Muskogee, Okla.

LETTER OF FERGUSON BROS.

MUSKOGEE, OKLA., *November 11, 1915.*

DEAR SIR: The approximate amount of freight received by us annually is 75 tons.

This may run a little more or a little less. However, we trust this information will be of some value or assistance to you in gathering your data as to the amount of tonnage received in Muskogee.

Yours, truly,

FERGUSON BROS.
By O. G. FERGUSON.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF TODD FURNITURE CO.

MUSKOGEE, OKLA., *November 6, 1915.*

DEAR SIR: Your inquiry of the 5th you ask about what our tonnage would be from Fort Smith and Little Rock. I would say from rate we have been shipping it would run about 40 tons per year. We would buy almost exclusively from these points on a low freight rate.

Respectfully,

TODD FURNITURE CO.
Per FAY TODD, *Manager.*

Mr. E. D. BEVITT,
Traffic Manager, Muskogee, Okla.

LETTER OF BEWLEY WHOLESALE FURNITURE CO.

MUSKOGEE, OKLA., *November 8, 1915.*

GENTLEMEN: You ask us the amount of tonnage that our freight would amount to which could be handled by way of the Arkansas River. Will say

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that the amount of freight that we handle by way of Memphis is but very little, probably 40,000 or 50,000 pounds, or about four cars, annually. However, there would possibly be other goods in our line that we could manage to ship by way of Memphis and the Arkansas River.

Hoping this will be a satisfactory explanation, we remain,

Yours, very truly,

BEWLEY WHOLESALE FURNITURE CO.,
Per L. A. BEWLEY.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF MUSKOGEE ELECTRIC CO.

MUSKOGEE, OKLA., *November 12, 1915.*

GENTLEMEN: Replying to your request for the approximate tonnage that we would be able to give for water transportation, provided the Arkansas River were navigable, would say that this would amount to approximately 15 tons per year.

Yours, very truly,

THE MUSKOGEE ELECTRIC CO.,
W. H. STUEVE, *Manager.*

TRAFFIC BUREAU, GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF PEABODY ELECTRIC CO.

MUSKOGEE, OKLA., *November 10, 1915.*

DEAR SIR: We write with reference to possible annual tonnage we could give a reliable water freight service plying the Arkansas River. If such a system were installed we could furnish approximately 50 tons per annum. This is a conservative estimate based on past purchases.

Yours, very truly,

PEABODY ELECTRIC CO.,
A. D. PEABODY, *President.*

Mr. E. D. BEVITT,
Manager Traffic Department, Greater Muskogee Association,
Muskogee, Okla.

LETTER OF BURROUGHS ADDING MACHINE CO.

MUSKOGEE, OKLA., *November 13, 1915.*

DEAR SIR: Replying to your recent inquiry with reference to the tonnage received by this office within a period of 12 months, will state that this will approximate 15 tons out of Detroit and probably 2 or 3 tons out of Chicago.

Trusting this is the information desired, we are

Very truly, yours,

L. V. HITCH, *Sales Manager.*

E. D. BEVITT,
Manager Traffic Bureau, Muskogee, Okla.

LETTER OF PHOENIX OFFICE SUPPLY CO.

MUSKOGEE, OKLA., *November 13, 1915.*

GENTLEMEN: Replying to your inquiry about how much freight we have inbound that could come via the Arkansas River, we have a little over 2 tons per year, on an average.

Our outbound shipments are all express and would not move by water.

Very truly,

PHOENIX OFFICE SUPPLY CO.,
J. T. WARD, *Manager.*

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

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LETTER OF MODEL PRINTING CO.

MUSKOGEE, OKLA., *November 10, 1915.*

GENTLEMEN: As regards Arkansas River navigation and the tonnage we could throw to the river, we believe we are safe in saying that we could ship via river for so small a business as ours at least 5 tons per year. When business is normal we could increase this very materially.

Yours, very truly.

MODEL PRINTING CO.,
D. E. MELTON.

MUSKOGEE TRAFFIC BUREAU,
Muskogee, Okla.

LETTER OF PHOENIX JOB PRINTING CO.

MUSKOGEE, OKLA., *November 15, 1915.*

GENTLEMEN: Referring to your recent request, we find that if the Arkansas River were navigable it would be possible for us to ship in 15 tons of paper per year by water.

Very truly, yours,

PHOENIX JOB PRINTING CO.,
By TAMS BIXBY, Jr., *Manager.*

GREATER MUSKOGEE ASSOCIATION, TRAFFIC DEPARTMENT,
Muskogee, Okla.

LETTER OF THE STAR PRINTERY.

MUSKOGEE, OKLA., *November 15, 1915.*

SIR: If the Arkansas River is made navigable, our firm's shipments of paper, etc., will not be less than 1 ton annually.

Yours, truly,

THE STAR PRINTERY,
S. B. HUDSON, *Manager.*

Mr. E. D. BEVITT,
Manager Muskogee Traffic Bureau, Muskogee, Okla.

LETTER OF ADLETA PAPER CO.

MUSKOGEE, OKLA., *November 9, 1915.*

DEAR MR. BEVITT: In regard to our tonnage, will say that last year it amounted to about 800,000 pounds, practically all of which could have been routed by water.

Trusting this is the information desired, we remain,

Yours, truly,

ADLETA PAPER CO.,
E. C. ADLETA.

Mr. E. D. BEVITT,
Manager Traffic Department, Greater Muskogee Association,
Muskogee, Okla.

LETTER OF THE MUSKOGEE TIMES-DEMOCRAT.

MUSKOGEE, OKLA., *November 5, 1915.*

DEAR SIR: The Times-Democrat is available for river shipment in the event the Arkansas River is made navigable to the amount of 300 tons of paper per annum and 8,000 pounds of ink per annum. This estimate is based on minimum consumption. Possibly the rest of our freight would come by rail.

Very truly,

MUSKOGEE TIMES-DEMOCRAT,
EUGENE M. KERR, *Publisher.*

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

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LETTER OF PHOENIX PRINTING CO.

MUSKOGEE, OKLA., *November 15, 1915.*

DEAR SIR: Replying to your letter regarding the tonnage available to us for river transportation, we are pleased to advise you that this company receives annually a little over 300 tons for the newspaper department alone.

Very truly,

MUSKOGEE DAILY PHOENIX,
H.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF GEO. D. HOPE LUMBER CO.

MUSKOGEE, OKLA., *November 15, 1915.*

DEAR SIR: Replying to your inquiry as to the amount of tonnage we could route via Arkansas River with river open for navigation, we could at the lowest estimate route 1,300 tons per year this way.

Yours, truly,

GEO. D. HOPE LUMBER CO.,
A. CATLETT.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association, Muskogee, Okla.

LETTER OF PAGE LUMBER CO.

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIR: We wish to advise you that the average freight weight handled by us in 12 months will amount to 960,000 pounds.

Yours, truly,

PAGE LUMBER CO.,
T. B. PAGE.

Mr. E. D. BEVITT,
Traffic Manager, Muskogee, Okla.

LETTER OF MR. H. E. KETCHAM.

MUSKOGEE, OKLA., *November 13, 1915.*

GENTLEMEN: Nineteen hundred and fourteen freight receipts at Muskogee 1,051 tons.

H. E. KETCHAM.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF MARSHALL LUMBER CO.

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIR: In answer to yours of the 9th instant in regard to the amount of freight handled by us in a year, will say that we handle about 50 cars of approximately 40 tons each, or about 2,000 tons.

Yours, truly,

MARSHALL LUMBER CO.,
Per R. S. MARSHALL.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

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LETTER OF MINNETONKA LUMBER CO.

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIR: In reply to your inquiry about the amount of freight that we handle each year, that would be possible to route via the river were it navigable and a boat line operated on same, beg to advise that we handle about 75 cars a year, of 40,000 pounds or more each, and a large portion of this business could be handled by a boat line if the rate was justifiable.

Yours, truly,

MINNETONKA LUMBER CO.,
By C. A. SAMSON.

Mr. E. D. BEVITT,
Traffic Manager, Muskogee, Okla.

LETTER OF THE T. H. ROGERS LUMBER CO. (INC.).

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIRS: In reply to your inquiry of recent date, regarding the shipments received by us, will say that our shipments have been very light for the past two years, averaging about 600 tons per annum. Will say that under normal conditions our shipments will average 1,000 to 1,200 tons per annum.

Yours, very truly,

THE T. H. ROGERS LUMBER CO.,
By G. S. KENNEDY.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF MUSKOGEE LUMBER CO.

MUSKOGEE, OKLA., *November 11, 1915.*

GENTLEMEN: Replying to yours of the 9th, beg to advise that our yearly tonnage of freight into Muskogee is about 960 tons. Nearly all of this could be handled via the Arkansas River. We would be very much pleased to see this waterway opened to navigation, as it would mean a large amount of money saved in the matter of freights.

Yours, truly,

MUSKOGEE LUMBER CO.,
By A. F. WORCHESTER, *President.*

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF J. A. BUTTS LUMBER CO.

MUSKOGEE, OKLA., *November 11, 1915.*

DEAR SIR: We have your inquiry as to how many tons of freight we might handle in a year's time. Will say we will probably ship 60 cars in a year, averaging 35,000 pounds to the car. This might come by river freight, and it might not.

Yours, truly,

J. A. BUTTS LUMBER CO.

E. D. BEVITT,
Traffic Manager, Muskogee, Okla.

LETTER OF STANDARD ROOFING & MATERIAL CO.

MUSKOGEE, OKLA., *November 11, 1915.*

DEAR SIR: Our tonnage at present via the Arkansas River per month would be about 50 tons during present conditions, and during normal conditions would be 125 tons or more.

Yours, very truly,

STANDARD ROOFING & MATERIAL CO.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

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LETTER OF NATIONAL SASH & DOOR CO.

MUSKOGEE, OKLA., *November 11, 1915.*

DEAR SIR: For your information we are pleased to advise our incoming freight amounts to approximately 350 tons per annum, of which amount about 150 tons could be handled via the water route.

Yours, very truly,

NATIONAL SASH & DOOR CO.,
L. B. SANDERS, *Manager.*

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF THE CRAFT SHOP.

MUSKOGEE, OKLA., *November 13, 1915.*

GENTLEMEN: We feel safe in saying that should the Arkansas River be made navigable we could handle freight to the amount of 2,000 pounds annually.

Respectfully, yours,

THE CRAFT SHOP,
By W. E. BROWN.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF A. FABBRO & CO.

MUSKOGEE, OKLA., *November 11, 1915.*

GENTLEMEN: Your letter of the 9th instant received and contents noted. We wish to advise that we use in the course of a year about 200 tons of freight. Trusting that this will help you on the 16th to show that we are the second city of Oklahoma, and some day to be the first.

Yours, truly,

A. FABBRO & CO.,
A. FABBRO.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF C. L. DICKMANN GLASS CO.

MUSKOGEE, OKLA., *November 11, 1915.*

DEAR SIR: We wish to advise you that should a proper rate be given us for transportation via the Arkansas River we could have the following material sent this way, basing same on 12 months: Eight carloads of window glass, each car weight about 40,000 pounds, which would originate at New Orleans, Galveston, or some other Gulf point. About 3,000 pounds monthly of plate glass from St. Louis in less-than-carload shipments to Muskogee, besides about 2,000 monthly to other Oklahoma points. About 24,000 pounds annually of rough rolled glass from St. Louis.

This above tonnage is based on a rather quiet year in the building business for this State, and in a prosperous year this would undoubtedly be several times larger.

Yours, very truly,

C. L. DICKMANN GLASS CO.,
By C. L. DICKMANN.

Mr. E. D. BEVITT,
Manager Traffic Bureau, Muskogee, Okla.

LETTER OF THE FARRELL WALL PAPER CO.

MUSKOGEE, OKLA., *November 13, 1915.*

GENTLEMEN: In reply to your inquiry we wish to advise that we could have approximately 50 tons of freight come via water route each year.

Very truly, yours,

THE FARRELL WALL PAPER CO.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

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LETTER OF MUSKOGEE MARBLE AND GRANITE FINISHING WORKS.

MUSKOGEE, OKLA., *November 15, 1915.*

DEAR SIR: As per your request regarding the amount of tonnage we would be in position to route via Arkansas River if it were open to navigation, we beg to advise that we could be able to route as above to the amount of from 125 to 150 tons per year.

MUSKOGEE MARBLE & GRANITE FINISHING WORKS,
By W. B. BAINBRIDGE, *Manager.*

Mr. E. D. BEVITT,
Muskogee, Okla.

LETTER OF BOCKENHEUSER & CO.

MUSKOGEE, OKLA., *November 15, 1915.*

GENTLEMEN: We quote you our yearly shipments at 6 tons, conservatively, covering white lead, paints, dry colors, and wall papers, which might be routed via the Arkansas River. We are,

Very truly, yours,

BOCKENHEUSER & CO.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF MUSKOGEE PAINT & GLASS CO.

MUSKOGEE, OKLA., *November 6, 1915.*

DEAR SIR: In reply to yours of October 29, also of the 6th instant, requesting that we send you a statement giving the amount of tonnage that we could give a boat line, provided that the Arkansas River was opened for navigation, wish to say that we could easily give 100 tons or 200,000 pounds of freight.

The above amount would be shipped from the following cities: Cincinnati, Louisville, Cleveland, Wooster, Chicago, and St. Louis. And, of course, should we be able to make connections with Atlantic seaboard points, especially New York, we could give considerable more to the boat line.

Trusting that the above information will be satisfactory and that we may succeed in getting the boat line and the Arkansas River opened up to navigation, we are,

Very truly, yours,

MUSKOGEE PAINT & GLASS CO.,
By JNO. H. THROCKMORTON, *President.*

Mr. E. D. BEVITT,
Traffic Manager, Muskogee, Okla.

LETTER OF R. E. REED PAINT & WALL PAPER CO.

MUSKOGEE, OKLA., *November 15, 1915.*

GENTLEMEN: If the Arkansas River were navigable it would be possible for me to ship between 35 and 40 tons per year by that route.

Yours, truly,

R. E. REED.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF A. HALVERSON CO.

MUSKOGEE, OKLA., *November 15, 1915.*

GENTLEMEN: If there was a water route into Muskogee from northern and eastern cities we would have about 6,000 pounds of freight which would be handled by same each month.

Yours, very truly,

A. HALVERSON CO.,
A. HALVERSON.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

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LETTER OF CARDINAL DRUG CO.

MUSKOGEE, OKLA., *November 11, 1915.*

GENTLEMEN: In replying to inquiry as to tonnage which could be routed via Arkansas River route, would state that at a conservative estimate we could guarantee you not less than 1 ton per month.

Yours, very truly,

CARDINAL DRUG CO.,
By W. E. DELEHANT.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF H. L. STERN JEWELRY CO.

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIR: If the Arkansas River were navigable it would be possible for me to route about 5 tons of high-class freight that way per year.

Yours, truly,

H. L. STERN.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF COHENOUR RYGEL CO.

MUSKOGEE, OKLA., *November 13, 1915.*

DEAR SIR: In regard to freight which we would have shipped via water route from either Chicago or St. Louis, beg to state it will amount to about 2 tons. Most of it is double first class.

Yours, truly,

COHENOUR RYGEL CO.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF THE ROBERTS MATTRESS MANUFACTURING CO.

MUSKOGEE, OKLA., *November 10, 1915.*

DEAR SIR: Our inbound material amounts now to about 39 tons per month, all of which could be routed via the Arkansas River were that stream navigable. We would be glad to so route it, as we believe that the Arkansas River improvement is essential to the upbuilding of this section of the country.

Yours, truly,

W. E. ROBERTS, *Manager.*

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF EAGLE HAY PRESS & IMPLEMENT CO.

MUSKOGEE, OKLA., *November 9, 1915.*

DEAR SIR: Replying to yours of the 6th regarding Arkansas River navigation, would say that we think it no exaggeration to say that if we had regular service on the Arkansas River out of here that we would be able to ship 5 to 10 carloads of goods in the season under present conditions; and as the country would naturally build up, as it surely would with freight service, think we would, in the course of a few years ship many times this amount.

Very truly, yours,

EAGLE HAY PRESS & IMPLEMENT CO.,
By GEO. J. STOUTZ, *President.*

Mr. E. D. BEVITT,
Greater Muskogee Association,
Muskogee, Okla.

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LETTER OF EMPIRE FIXTURE WORKS.

MUSKOGEE, OKLA., *November 12, 1915.*

GENTLEMEN: Replying to your request for approximate tonnage that we would be able to give for water transportation, provided the Arkansas River were navigable, would say that this would amount to approximately 70 tons per year.

Yours, very truly,

THE EMPIRE FIXTURE WORKS,
H. P. HERBERT, *Manager.*

TRAFFIC BUREAU,
Greater Muskogee Association.
Muskogee, Okla.

LETTER OF EAGLE BROOM CO.

MUSKOGEE, OKLA., *November 13, 1915.*

DEAR SIR: Following is an estimate of the amount of tonnage that we use per month: Broom corn, 7 tons; material, 2 tons; total, 9 tons.

The material mentioned above could move via the river, as it all comes from St. Louis. In addition, we could ship about 1 ton per month of brooms to down-the-river points.

Yours, truly,

EAGLE BROOM CO.,
By A. L. GILLIAM.

MR. H. D. BEVITT,
Muskogee, Okla.

LETTER OF MR. J. C. WYNN.

MUSKOGEE, OKLA., *November 13, 1915.*

DEAR SIR: If the Arkansas River were navigable, I could have approximately 10 to 12 cars a year of hardwood shipped that way if the cost of freight would be less than by rail. Minimum cars, 45,000 pounds.

Yours, respectfully,

J. C. WYNN.

Mr. E. D. BEVITT,
Traffic Manager, Muskogee, Okla.

LETTER OF WHEAT'S WOOD WORKER.

MUSKOGEE, OKLA., *November 15, 1915.*

GENTLEMEN: I hereby certify that the probability is that if the Arkansas River was navigable there would be something like 30 to 40 tons in and out over this route for this shop. I am the sole owner, and it is being operated every day.

Very respectfully,

R. W. PARIS.

THE GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

LETTER OF MUSKOGEE IRON WORKS.

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIR: Replying to your telephone inquiry will say that our tonnage for the year that could be handled by the water route would amount to about 1,000 tons a year at a conservative estimate.

Yours, very truly,

MUSKOGEE IRON WORKS.
E. R. NALL.

Mr. E. D. BEVITT, *Muskogee Traffic Bureau.*

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LETTER OF MUSKOGEE TOOL CO.

MUSKOGEE, OKLA., *November 13, 1915.*

GENTLEMEN: In reply to your letter of recent date requesting to know the amount of freight we received per year that could be handled via rail or water with adequate facilities, would say that we handle on an average 15 cars of iron and steel, weighing approximately 50,000 pounds each.

Trusting this is information desired, we beg to remain

Very truly, yours,

THE MUSKOGEE TOOL CO.
H. G. WEAVER.

GREATER MUSKOGEE ASSOCIATION, *Muskogee, Okla.*

LETTER OF O. K. SHEET METAL WORKS.

MUSKOGEE, OKLA., *November 13, 1915.*

GENTLEMEN: In the interest of Arkansas River navigation I wish to advise that we receive approximately 100,000 pounds of sheet metal, roofing, and like products that might well be shipped via the river.

Yours, very truly,

O. K. SHEET METAL WORKS,
By A. C. WRIGHT.

GREATER MUSKOGEE ASSOCIATION, *Muskogee, Okla.*

MUSKOGEE VEHICLE & MACHINERY CO.

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIR: Refering to your letter of recent date asking what the probable tonnage would be that we could route via river from eastern points, will say we get about 90 per cent of all of our corn mills, elevator machinery, well drills, and gas engines and steam machinery from points east of the Mississippi River, some of which is handled by ocean steamers to New Orleans, and from there by rail, and I should estimate that we could handle from these points about 300 tons per year under normal conditions.

Yours, very truly,

MUSKOGEE VEHICLE & MACHINERY CO.,
By R. A. LESTER, *President.*

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF MUSKOGEE CARRIAGE & AUTOMOBILE WORKS.

MUSKOGEE, OKLA., *November 10, 1915.*

DEAR SIR: In answer to your letter of the 9th instant I would say if the Arkansas River would be navigable it would be a great thing to Muskogee.

If the Arkansas River was navigable, I could have most of my freight come by boat. Our freight amounts to about 28 tons per year. And, of course, in a few years the freight will increase considerably, and in 10 years the increase will double.

Hoping the Board of Engineers will pass on it favorably,

Yours, very truly,

MUSKOGEE CARRIAGE & AUTO WORKS,
By F. B. TUTTLIS.

Mr. E. D. BEVITT,
Muskogee, Okla.

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LETTER OF OKLAHOMA WAGON WORKS.

DEAR SIR: In our business we use about 40,000 pounds of iron per year, which could be routed via the Arkansas River were that stream navigable.

Yours, truly,

OKLAHOMA WAGON WORKS,
By M. L. REID.

Mr. E. D. BEVITT,
Traffic Manager Greater Muskogee Association,
Muskogee, Okla.

LETTER OF W. R. LANTZ CARRIAGE & AUTOMOBILE WORKS.

MUSKOGEE, OKLA., *November 12, 1915.*

DEAR SIR: In reply to your inquiry as to the amount of freight we handle, wish to state that it will amount to more than 500,000 pounds.

Yours, respectfully,

W. R. LANTZ CARRIAGE & AUTO WORKS,
By W. R. LANTZ.

Mr. E. D. BEVITT,
Traffic Manager, Muskogee, Okla.

LETTER OF SHIPP CIGAR CO.

MUSKOGEE, OKLA., *November 12, 1915.*

GENTLEMEN: In answer to your letter of the 9th will say that we have about 3,000 pounds of freight per year.

Yours, respectfully,

SHIPP CIGAR CO.,
By J. W. SHIPP.

GREATER MUSKOGEE ASSOCIATION,
Muskogee, Okla.

STATEMENT OF GREATER MUSKOGEE ASSOCIATION.

Population of Oklahoma (United States census): 1890, 258,657; 1900, 790,391; 1910, 1,657,155.

Principal grains for 1914: Wheat, 47,975,000 bushels; corn, 50,000,000 bushels; oats, 30,250,000 bushels; barley, 175,000 bushels; rye, 96,000 bushels; Irish potatoes, 2,240,000 bushels; sweet potatoes, 612,000 bushels; hay, 508,000 tons; wool, 411,000 pounds. (Yearbook of Department of Agriculture.)

Wheat and corn, Oklahoma.

[Authority Abstract of Thirteenth Census.]

	1907	1908	1909	1910
Wheat	8,631,000	15,265,000	15,680,000	25,542,000
Corn	113,265,000	122,239,000	101,159,000	91,769,000
	1911.	1912.	1913.	1914.
Wheat	8,976,000	20,026,000	17,500,000	47,975,000
Corn	36,888,000	101,878,000	52,250,000	50,000,000

Value of all farm property, Oklahoma: 1890, $12,221,020; 1900, $277,525,433; 1910, $918,198,882. Increase, 1910 over 1900, $640,673,449. (Authority, Abstract of Thirteenth Census.)

Value of all farm crops, Oklahoma: 1909, $133,454,405; 1899, $43,759,824. Increase, $89,694,581. (Authority, Abstract of Thirteenth Census.)

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Value of manufactured products, Oklahoma: 1899, $8,134,000; 1904, $24,459,000; 1909, $53,682,000. Increase, 1900 over 1900, $29,223,000. (Authority, Abstract of Thirteenth Census.)

STATEMENT OF MR. GEO. SENGEL.

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

GENTLEMEN: The suspension of navigation on the Arkansas River in the Fort Smith zone has been instrumental in retarding the development of the agricultural and mining interests more than any other factor. The advent of railroads was slow and confined to sections offering the greatest inducements. The course of the Arkansas River is through a most fertile valley, as rich as the valley of the Nile, with more potentialities and, commercially speaking, vastly superior to the river in Africa. I doubt if there is a section in the United States that has developed as rapidly as that section through which this great Nile of America penetrates.

This development has been accomplished without the aid of the Arkansas River or the United States Government. It was materialized through the efforts of the people who looked into the future and were attracted to the great Southwest by the many dormant resources which awaited the coming of up-to-date people, who have built an empire as if by magic, without the assistance of the natural outlet through the Arkansas River.

Since the building of the railroads the attention of our people was diverted from water transportation, and now we realize the great losses sustained by not keeping alive the many advantages of this great artery of trade. In former years, before a railroad was built to Fort Smith, I have seen as many as 12 steamboats at our wharf at one time. Those boats were regular packets between New Orleans, Cincinnati, and St. Louis. We generally had water for boats eight months of the year, and we could always depend on a June rise that lasted several months.

During the period of water navigation up the Arkansas to Fort Smith the National Government came to our relief in keeping the river free of snags which interfered with boating on account of the shifting channels. The river bed was not as wide as now; it was confined to a narrow bed, and with the aid of snag boats and the building of jetties we were quite well cared for. But our great joy in being put in touch with the outside world through the medium of railroads caused a general neglect of the Arkansas River, not only by our people but by the Government, which was but natural.

Now a general awakening throughout the sections along the Arkansas River has aroused our people, and they realize the great loss sustained in the past 35 years of neglect and general indifference to the importance of having navigable water in the Arkansas River. The river bed would cost more than the Panama Canal if it had to be excavated, but nature gave us this great artery of trade and it remains for us to utilize it, confine the water, and again restore navigation, and thereby develop a magnificent section with untold millions of tons of coal, corn, wheat, oats, cotton, lumber, cotton seed, cottonseed oil, and the natural oil found throughout this great section of our country.

Cities have been built where only a few years ago civilization was a cheap commodity, and agricultural development was practically unknown.

We beg to state that the question of transportation to and from the seaboard has become of vital importance to the future development of this country, especially in handling bulky and heavy freights, more especially those shipped to and from foreign ports, where time in transit is of no great importance.

We call attention to the fact that the Arkansas River is one of the longest great waterways of the United States, draining the watershed of about 189,000 square miles, embracing a great part of the States of Missouri, Kansas, Colorado, Arkansas, New Mexico, and Oklahoma, an area of country that is as rich in natural resources as any in the United States, which is now more rapidly filling up with an enterprising population and in which all the lines of productive industry are springing up at a more rapid rate than any other part of the country.

While this territory is blessed with facilities for rapid transportation by the many railroads which have within the last few years been built and are now traversing it, still the question of low freight rates for the great amount of heavy and bulky freights now produced for export is one that must be solved soon if this country is to continue present progress in development.

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Water transportation is the only way in which the heavy cheap products can find markets that will justify shipment, and that the Arkansas River is the natural, great interstate highway from the interior to the seaboard and southwest and foreign ports, and, if properly improved, is available for this purpose the year around from Wichita, Kans., to the mouth. And, as part of this, we beg to call attention to Document No. 90, House of Representatives, first session, Forty-ninth Congress, wherein H. S. Tabor, captain of Engineers, in his report upon the survey made of the Arkansas River from Wichita, Kans., to Fort Gibson, under date of February 18, 1886, uses the following language:

"There is no doubt but that a channel can be provided wherever the development of the country warrants it, and the river should be, for all purposes of law, rated as navigable to Wichita, Kans."

In a letter from the late William L. Sibert, captain of Engineers, dated Little Rock, Ark., December 5, 1896, he said:

"In reply to your request for information concerning the improvement of the Arkansas River, will submit the following:

"The present project was adopted from the mouth of the river to Little Rock in 1886, and extended from Little Rock to Wichita, Kans., to 1888, and is: 'To remove rock and gravel reefs by blasting and dredging, to contract the channel by dikes or dams, permeable or solid, of such construction as the local conditions require, and to hold the channel so obtained by revetment where necessary from the mouth to Wichita, Kans., the object being to obtain a channel depth of 6 feet from Little Rock to the mouth and one of 2 feet above Little Rock at low water.'

"Work of the character contemplated in the approved project, in a river like the Arkansas, in general does not produce the full effect hoped for until the work of improvement is continuous over a certain reach of river. The work done in previous years has been so scattered that only local improvements have resulted. There has been no increase of depth for a length of river sufficient for a steamboat trade.

"The amounts appropriated for the different reaches of river have been so small in comparison with the amount necessary to accomplish the work proposed in project in that reach, that it has been impracticable to carry the work on systematically over a reach of river of sufficient length to be of any practicable benefit to navigation other than the maintaining of the channel through the draw spans of bridges.

"The work done, however, if no great changes occur before money is available in sufficient quantity to carry on the work to advantage, will form a part of a complete system." (See Annual Report, Chief Engineers, 1896.)

The question as to whether the commerce developed would justify the expenditure, is one upon which I can not express an opinion. This is the phase of the question that should be investigated by the convention.

That a systematic regulation of the river from its mouth to the mouth of the Canadian would increase the channel depths, I have no doubt; just how great a depth can be made and maintained can only be told after a trial reach has been systematically improved. A systematic regulation of the channel will prevent the caving of the valuable farming lands, and will make levees in the lower river permanent, and will reduce largely the necessity for snagging operations.

Perhaps it will be interesting to know how well we have accomplished developments in the Fort Smith zone without water transportation owing to the practical abandonment of the river by the National Government.

Sebastian County produces, every year, over 2,000,000 tons of coal, and the eastern portion of Oklahoma, tributary to water, produces the same amount and that section, as well as our own, is in its infancy in coal production. If the Arkansas River could be commercially utilized, the output of coal would be doubled and barged down the river, supplying all river towns down to New Orleans.

All the Mississippi ports depend on coal from Pennsylvania on account of water transportation all through the year. Arkansas coal is equal to the Pennsylvania coal, and much of our coal being smokeless is superior, and would find a ready sale if water transportation would be given us. The smokeless coal of Sebastian County would be used by our Navy if we could meet water transportation to tidewater. The smokeless character of our coal will

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be a factor in naval activities when the United States adopts preparedness for protection from unforseen conditions and we of the interior are linked in bonds of financial and commercial relations with the seaboard cities which appeal to us, and we rejoice that we would not only contribute men but smokeless coal in defense of our Nation.

Ten per cent of all the hardwood in the world is in Arkansas. Much of this valuable asset is shipped out of our State in the raw state and manufactured into the finished product in other States. This raw material is shipped out of our State by rail in order that the lowest freight rate will be obtained. Water competition would induce factories to be established in our State.

We have a wagon factory in Fort Smith with an annual capacity of 15,000 jobs, the weight of this output being 15,000,000 pounds. It requires 600 cars of 25 wagons each to handle this annual output. We manufacture every year 1,500 carloads of finished furniture, which is shipped in every direction.

We manufacture coal-shovel handles in Fort Smith for the English mines and ship them to New York by rail for export instead of down the Arkansas and Mississippi rivers to tidewater. What a wonderful saving to our city and manufacturer if water transportation was available.

The largest sorghum-sirup mill in the world is located in Fort Smith, and they have just finished their season's run and have now stored in their mammoth tanks 150,000 gallons of finished sirup, which is awaiting shipment to St. Louis to be reduced to commercial packages. Water transportation would reduce the freight rate and increase the price for the raw material.

These 150,000 gallons of sirup will be increased from year to year, bringing a new crop into commercial importance and adding another element into the diversified agricultural development of our section. This industry is very new, this being its second season, and consumed the cane produced on 2,000 acres of land.

This sirup mill has a capacity of 5,000 acres of cane and will reach that limit within two or three years. This year's output will require 90 cars to transport the sirup. The weight of the sirup amounts to 1,800,000 pounds.

When we reflect that only 15 per cent of the land in Arkansas is under fence and the immense products marketed from this small development, it shows a wonderful development awaits us and that a great State is coming into its own. If our waterways are conserved and made navigable Arkansas will be the richest State in the Union in her natural resources being developed.

In the investigations of the rivers of Arkansas I have considered the State's production and how much greater our showing would be if the great arteries of trade in our State received the aid necessary to develop the thousands of acres now dormant on account of no transportation except the primitive transportation of the wagon to the distant railroads. Miles and miles of rivers flow leisurely down their course through fertile valleys too far removed from railroads and with no river transportation, from which the magic touch of the farmer is withheld and attracted to other States less favored in climate and productivity, but geographically in the zone of greater commercial activities, and consequently is better able to secure recognition from the National Government than this great State receives.

Permit me to give you Arkansas summarized statistically, which may surprise you, and, I hope, will aid you in determining your action in bringing into existence again an almost forgotten source of wealth-producing element that should be redeemed and not abandoned. The countries of Europe spend more money in building canals than we spend to protect our natural waterways, yet the railroads are owned by the governments of Europe, and the waterways that are built, as well as the rivers, enter into competition with each other, thereby creating industrial wealth and developing patriotism in her people. No better evidence is needed than existing conditions over the sea.

Arkansas begs to give you the following statistics, which can easily be verified, and upon closer investigation will go beyond these figures, as many did not reply to our inquiries. I am giving you comparative statements. In 1880, fifteen years after the Civil War, Arkansas again began the development so ruthlessly stopped in 1861; consequently I will give you our statistics in 1880, compared with 1914.

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	1890	1914
Population	802,525	1,624,000
Manufactures:		
Capital	$2,953,000	$70,174,000
Products, value	$6,765,000	$74,916,000
Cotton mills:		
Spindles active	2,015	7,000
Looms active	28	164
Cotton used, pounds	340,000	4,544,264
Cottonseed oil mills, products	$590,000	$7,700,000
Lumber cut, feet	172,603,000	1,777,303,000
Improved farm lands, acres	3,595,603	8,052,000
Farm lands, buildings, value	$74,749,655	$308,129,000
Agricultural products, value	$43,796,000	$168,375,000
Cotton crop, running bales	608,256	846,000
Grain, bushels:		
Corn	32,350,000	52,163,000
Oats	2,749,000	3,463,000
Live stock:		
Cattle	662,000	942,000
Sheep	247,000	134,000
Swine	1,565,000	1,738,000
Mineral products, value	$65,535	$5,600,000
Coal mined, tons	14,778	3,500,000
Railroad mileage	859	5,230
National banks:		
Resources	$779,491	$36,907,000
Capital	$305,000	$5,035,000
Individual deposits	$265,382	$18,785,000
Other banks, deposits	$577,628	$32,106,521
Common school expenditures	$287,056	$3,187,000
Property, true value	$286,000,000	$971,000,000

If the Arkansas River is redeemed, the several cities along its banks will liberally patronize the boats that will again ply that great artery, and local enterprise will assert itself and own boats to relieve congested tonnage and give employment to thousands of people and develop thousands of fertile lands now idle.

Our commercial organization stands ready to render you any assistance in determining your report, and respectfully invites you to visit our city and section so we may personally show you what awaits water transportation in the richest zone along the great Nile of America, the Arkansas River.

Near Fort Smith great veins of coal are seen projecting from the banks of the Arkansas and Poteau Rivers, but not mined on account of no water transportation. This great source of wealth would be developed if we had water in the Arkansas River and supply the cities and towns along its banks as well as Mississippi and Louisiana with cheap fuel.

On behalf of our people, I beg to thank you for this opportunity and your visit to our State.

GEO. SENGEL,
Secretary Business Men's Club,
Fort Smith, Ark.

STATEMENT OF MR. JAMES P. HOYE.

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

GENTLEMEN: I would respectfully ask your kind indulgence to listen to a few facts in connection with the coal industry of Arkansas and a part of Oklahoma, with reference to its past and present status and its prospective with river transportation established.

According to Mr. Parker, of the U. S. Government Geological Survey, every coal-producing State in the Union has in the last 10 years increased their coal production several hundred per cent save and except Arkansas, which State was producing more tonnage 10 years ago than it is to-day.

You might well ask why should such an abnormal condition exist. Are the coal fields becoming exhausted? Is the quality of the coal inferior to the coal mined in other States? There must be a reason for this condition and also a remedy. Yes; there are several reasons, and as I view it (and I have had more than 20 years' experience in coal mining in Arkansas and Oklahoma) only one remedy.

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In answer to the first query, I will say the coal fields of Arkansas are not only not near exhaustion but have hardly been scratched.

With reference to the second, I will say the United States Government analysis shows that the Arkansas coal is superior to any other coal mined in the United States outside of the Pennsylvania anthracite field. Very high in fixed carbon, low in ash, moisture, and sulphur.

Take the map of the United States and note the geographical position of Arkansas. It is bounded on the east by the Mississippi River, the south by Louisiana and Texas, the west by Oklahoma, and on the north by Missouri.

The States of Louisiana and Texas have practically no coal and should be the legitimate market for the Arkansas product, but on account of the vast amount of oil and gas discovered and produced in Louisiana, Texas, and Oklahoma they supplanted the Arkansas coal and forced it to find another market farther from home. It could not go east to Memphis, on account of the cheaper water rates established at that point. To find any market at all it had to go north and compete in the Kansas and Nebraska markets with Kansas, Missouri, and Iowa coal, each of them having a very decided advantage in freight rates. Take the Kansas City market as an illustration. It costs the Cherokee and Crawford County (Kans.) operators 75 cents per ton to ship coal to Kansas City, while it costs the Arkansas operators $2 per ton—the same differential exists at all other competitive points. On account of this great handicap the Arkansas mines could not get a fair proportion of the business and are, in consequence, idle a great portion of the time. There has been no new development in the Arkansas fields in recent years.

Several million dollars are invested in coal properties in this State and, in discussing the coal situation with several very prominent Arkansas operators, we all thought that upon the completion of the Panama Canal and the Arkansas River opened to navigation that the future would be full of promise for the coal industry of the State, inasmuch as we never expect the freight rates to be reduced to meet the Kansas rate, and the oil and gas production is constantly growing, there is no salvation for the coal industry of Arkansas other than an outlet to New Orleans and the Gulf via the Arkansas River, and operators would be almost compelled to equip for river transportation, and would do so gladly.

The above statement is not guesswork. I know whereof I speak.

Three years ago, simply on the assurance that the Government had appropriated $600,000 to build dredge boats to keep a channel open in the river, the late and lamented ex-United States Senator W. M. Kavanaugh and myself interested the Hon. John C. C. Mayo, of Kentucky, a multimillionaire (who made his millions in coal), in organizing a large operating company to ship coal on a large scale to New Orleans and the Panama Canal. When the plans were practically matured and the time set for me to commence acquiring from fifty to sixty thousand acres in Arkansas, Mr. Mayo was stricken and taken to a sanitarium in Cincinnati, lingered several months, and died; and our plans fell through. Mr. Mayo was farsighted and could see that it would be a paying proposition to operate mines in Arkansas if he could ship by water.

I have made arrangements in connection with Mr. G. O. Patterson, a prominent attorney of Clarksville, this State, to organize a coal company in Logan County, Ark. We have secured an option on 500 acres of coal land lying on Cane Creek, on which land we intend to open a mine, equipped to load coal in barges as well as in railroad cars. Our site is ideal, about three-fourths mile from mouth of creek, which is deep and, with little dredging, can be made a fine loading place and harbor.

We expect to be able to load 500 tons per day in one year from sinking shaft. We would have had the shaft sunk by this time were it not for the fact that a Government official in connection with river work stated that the Government was contemplating abandoning the Arkansas River. We decided then to await results.

If the Arkansas is made navigable for at least eight months in the year, we can and will load and ship not less than 50,000 tons per annum by river.

Other operators and owners of coal lands will in self-defense be compelled to either quit mining or find another outlet or market.

An absolutely sure and steady market is assured when New Orleans and Gulf points are reached by barges. New Orleans alone, to say nothing of other Mississippi River points, could, and would, use most of the coal produced from the Arkansas River mines, could we only reach them by water. It is impossible to supply them now on account of freight rates. The rate from here to New

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Orleans by rail is $2.95 per ton. We could easily reach that market by river if we could load our coal in barges. We could ship coal there for less than 75 cents per ton. Western Pennsylvania ships millions of bushels of coal from the Allegheny and Monongahela coal fields to Memphis and New Orleans, which is used by those cities or distributed from them to inland points. We are fully 700 miles nearer and have here in Arkansas and on the tributaries of the Arkansas River boundless forests of pine to build our barges in which to carry our coal.

A description of the coal fields lying along and adjacent to the Arkansas River between Little Rock and Muskogee may be of interest to your honorable board.

In going up the river the first coal field we find is the Russellville field, situated between Russellville and Dardanelle, and described in Branner's Geological Report as the "Shinn Basin," comprising approximately 3,000 acres of anthracite coal. This vein ranges from 32 to 36 inches in thickness and is sold in direct competition with the Pennsylvania anthracite; it is crushed and sized the same as the latter; made into "grate," "egg," "stove," "4," "nut," "pea," "chestnut," and "black." There are two coal companies operating mines and producing about 400 tons per day during their shipping season, their capacity being much larger, however. Those mines are not quite 2 miles from the river. The coal is all being shipped by the railroad, nearly all of it going north and west; none of it goes to Memphis or New Orleans or Mississippi River points, on account of the freight rates, the Pennsylvania coal being shipped there in barges by river.

West of Russellville 8 miles we find another coal, known as the "Ouita Basin." This vein is 28 incnes in thickness—an anthracite coal conceded to be the best between Pennsylvania and Colorado. The Ouita Anthracite Coal Co. are operating a mine producing 50 tons per day. The Ouita Basin extends within about 2 miles of the river and is on the Illinois Bayou. There are approximately 2,500 acres of developed and proven coal in this field. The Shinn Basin and Ouita Basin are located just 75 miles by rail west of Little Rock.

The next coal we find up the river is what is known as the "Spadra" field. This is situated 105 miles west of Little Rock. This is also a high-grade coal, known as anthracite, and is sold and used as such, and is rapidly supplanting the Pennsylvania anthracite wherever introduced. This vein ranges in thickness from 3 feet to 46 inches on the north side of the river and from 34 to 64 inches on the south side. On the north side of the river the Spadra field contains approximately 14,000 acres, and coal is now being mined by 12 different coal companies, the majority of which have modernly equipped plants, costing from $50,000 to $200,000, and have a producing capacity of more than 500,000 tons annually. A fine loading place and harbor for barges can be made at Spadra or at the mouth of the Spadra Creek. On the south side of the river, in Logan County, the Arkansas Antrhacite Coal Co. owns nearly 16,000 acres of this same coal. They own fully 10 miles of river front. This entire tract has been fully prospected and the coal lies under the river the entire 10 miles, and according to the records of the drill holes show the vein to range from 34 to 64 inches, the thickest coal being along the river front and adjacent. There are no mines in operation in the field, for the reasons that there is as yet no means of transportation, except by rail,, and the prohibitive freight rates to the north, as before stated:

The Navy Department has made tests of this coal which, I understand, was highly satisfactory. It is absolutely smokeless, and carries fron. 7? to 83 per cent fixed carbon; it is low in moisture, ash, and sulphur. There are fully 100,000,000 tons of coal to mine in this field. A good loading place and harbor for barges can be made for this field also at the mouth of Cane Creek. This is known as the "Prairie View" field.

About 12 or 15 miles farther west we come to the "Denning" field. This is a different vein of coal to either of the others heretofore mentioned. It is an exceptionally high grade of bituminous coal, ranging from 76 to 78 per cent fixed carbon; is smokeless and is unexcelled as a steam producer, ranks in the Government fuel tests with the celebrated "Pocahontas" coal. This vein is thicker than the others, ranging from 3 feet and 10 inches to 5 feet in thickness. This coal field extends along the river several miles and has approximately 3,000 acres in it.

Across the river on the south side is what is known as the "Paris" field. Several mines are in operation; they are about 5 or 6 miles from the river.

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This is also a high-grade coal, the vein being 32 inches in thickness. The Paris operators have to ship their coal 46 miles west to Fort Smith, and then bring it back that distance to get it to Little Rock or any central or eastern part of the State. There are about 4,000 acres in this field.

Next we come to the Sebastian County coal field. This is by far the largest coal field in the State and produces about 70 per cent of the tonnage of the State. The Sebastian County coal is the same grade as the Franklin and Johnson County coal. A very fine harbor and loading place can be made, I am informed, at the mouth of Vache Grasse Creek. The Vache Grasse Valley is all underlaid with coal, some of the largest mines in the State being in that territory, viz, "Jenny Lind" and "Greenwood," there being not less than 35,000 acres of good workable coal in that district accessible to the river by tram. This Greenwood district coal will average 5 feet in thickness, or an approximate total of 175,000,000 tons.

I do not include in the above the whole of the Sebastian County field; only that part that would be close enough to the Arkansas River to justify hauling from mine to river tipple.

Next we come to Fort Smith, where the Poteau River empties into the Arkansas. I am more or less familiar with loading coal in barges. I have lived on streams that were utilized for barging coal, and I firmly believe it will be a very small job to make the Poteau River navigable for barges the whole year round, at least as far as the city of Poteau, which is in the heart of eastern Oklahoma coal field. I have been up the Poteau several miles in a motor boat. This is also a very high grade of bituminous coal. There are a number of mines in operation in this field and the acreage is vast, as the coal field is continuous for fully 40 miles west of Poteau, with a width from north to south of about 30 miles, and the land carries on a good portion of this area three veins of good workable coal. The tonnage is enormous.

Oklahoma is handicapped in its coal development by the same causes as Arkansas, but in a lesser degree. She needs an outlet, and the Poteau and Arkansas Rivers can supply it.

To sum up, we have in the proven and working coal fields enumerated the following coal acreages and possible tonnage:

	Acres.
Shinn Basin	3,000
Ouita Basin	2,500
Spadra Basin (north side of river)	14,000
Prairie View (south side of river)	20,000
Denning	3,000
Paris	4,000
Sebastian	35,000
Eastern Oklahoma	50,000
Approximate total	131,000

The present production is nearly as follows:

	Tons.
Russellville, about	60,000
Ouita, about	15,000
Spadra, about	200,000
Denning, about	175,000
Paris, about	20,000
Sebastian, about	350,000
Eastern Oklahoma, about	150,000
Approximate total	960,000

It is very conservative to place the available coal tonnage of the fields named at 800,000,000 tons, and while our annual production is only about 900,000 tons the mines in operation have the necessary equipment and capacity to produce 2,000,000 tons per annum, and it is safe to predict that the present equipped mines would produce fully that amount had they the advantage of river transportation, for the reason that under existing conditions the mines of this territory are practically located so that their legitimate market is cut in two, inasmuch as Memphis and all the Mississippi River points have the benefit of water rates, with which we can not compete.

If river transportation was an assured fact, a number of the present coal companies would hail with delight the opportunity to ship their coal in barges

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to New Orleans and other river and Gulf points. It would also be an inducement for new coal companies to open up mines for river shipments.

I venture the prediction that if the Arkansas River is made navigable that in less than 10 years more coal will be shipped in barges on the river than is now produced and hauled by rail in the entire State of Arkansas.

I have been 20 years in the coal fields of Arkansas—as mine foreman at Denning 2½ years, superintendent of W. C. & M. Co. mines at "Jenny Lind" between 5 and 6 years, general manager of the Ouita Anthracite Coal Co. 6 years, and have leased and operated mines for several years past. I have had charge of mines in Oklahoma and Missouri before coming to Arkansas. The last two years I have not been engaged in coal mining, but would be only too glad to reengage if I could ship by river.

Very respectfully,

JAMES P. HOYE.

STATEMENT OF MR. CARL J. BAER, SECRETARY OF THE LITTLE ROCK CHAMBER OF COMMERCE, AND THE ARKANSAS RIVER IMPROVEMENT ASSOCIATION.

NOVEMBER 16, 1915.

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

GENTLEMEN: For the past four years I have made a thorough study of the conditions existing along the Arkansas River and of boats used in navigating shallow streams.

Last year the chamber of commerce placed the steamer *Golden Fleece* on the river to make regular weekly trips between Memphis and the city of Little Rock. This boat operated over a period of five months, and was compelled to withdraw from the river on account of snags and sandbars making it impossible to continue navigating to Little Rock. We have complete cost sheets, showing cost of operating this boat, which enables us to make comparisons in costs of operating other boats.

A special trip was made by the writer throughout the United States to the following rivers: The Savannah, Ocmulgee, and Chattahoochee in Georgia; the Tombigbee, Warrior, and Alabama in Alabama; the Red, Ouachita, and White in Arkansas; the Missouri at Kansas City; the Kanawha, Monongahela, and Allegheny in West Virginia and Pennsylvania; and the Ohio along its entire length for the purpose of studying conditions on these rivers, and particularly studying the type of boats used on inland waters.

Type of boats.—In the past half century there has been practically no improvement in the methods of operating the old type of steamboat. It still has the expensive type of slide-valve engine, the usage of muddy water in the boilers, the heavy fuel expense in the purification of water for boilers, the abnormal weight of the wheels, boilers, engines, cabins, decks, and its heavy wooden construction. Marine engineers are now giving a great deal of consideration to the modern steel constructed self-propelled barge with watertight bulkheads equipped with modern oil, gas, or superheated steam engines, using the open propeller wheel in deep water and the tunnel type wheel in shallow water.

Up to the present time, to my knowledge, there are 10 self-propelled shallow-water barges in use on inland rivers, nearly all of which barges were equipped for usage in still water or slow-moving streams.

The several barges owned by the Alabama Transportation Company, used in the Bourne Canal and in the vicinity of New Orleans, were built by Engineer Bernhard. Some of these boats are carrying self-gas producer engines and are heavier than the oil or superheated-steam equipment. One boat on the Savannah River, and one on the Ocmulgee River in Georgia, has been built with the tunnel type wheel equipment to carry 250 to 300 bales of cotton on 36 inches of water; the boats being 130 feet long by 28 feet beam. The average fuel cost per hour for the running of this type of boat is 26 cents. The number of men necessary to man this boat is five on a single run of 12 hours and nine on a double run of 24 hours.

The Kansas City Navigation Co. has three towboats, two of which are equipped with the tunnel type wheel, but both are makeshifts, being old steel-bottomed boats with the tunnels built in the boat to the best advantage. These boats are doing splendid work, and many important tests have been made, which will enable the engineers in charge to materially improve construction in all new boats built.

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One tunnel type boat in operation now at Charleston, W. Va., and owned by the Government, has proved a success. The Inland Navigation Co., have about completed a modern steel barge, now at Jeffersonville, Ind., over 200 feet in length, with water-tight bulkheads, and four propeller wheels, each equipped with 100-horsepower oil engines.

The building of the modern steel craft for inland waterways is, of course, yet in its experimental stage, but sufficient results have been obtained by the usage of the self-propelled barges to warrant a most thorough investigation on the part of the business man who contemplates navigating in shallow inland streams. The power barges are also used as towboats in most instances, the Kansas City (Mo.) Navigation Co. towing one or two barges on each trip.

The marine insurance rate on the steel craft has been very materially reduced and now stands at about 3 or 4 per cent.

I am quite positive on the Arkansas River we can equip a towboat and barges to carry a sufficient amount of tonnage against the flow of the stream to make a profit. The down-river pull without question shows a handsome profits even by the utilization of the old type of boat, but the old-style barges used on Ohio and Mississippi Rivers in carrying West Virginia coal have scarcely ever hauled any freight on the return trip upstream. A test made on the Mississippi River in the summer of 1914 by Mr. Bernhard showed the average time up the river with 1,000 tons to be less than 3 miles per hour, but this boat, over 200 feet long, was only equipped with two 75-horsepower self-gas-producing engines, and it was the first boat of its kind ever placed on the Mississippi River, and was built for still water, and, of course, was underpowered for upstream navigation.

The success of the Kansas City (Mo.) Navigation Co. is well known to this board, as I understand a full and complete history of the proposition has been submitted to you.

The difficulty in navigating a swift-flowing stream with the acute bends, such as in the Arkansas River, is in guiding the boat around the bends, and unless a boat of the old type can obtain sufficient momentum upstream or is moving at a certain speed, the action of the rudder or steering device is almost nil, but with the modern steel craft equipped with two or three propeller wheels, the wheel on one side of the boat can be propelled forward and on the other side reversed, thereby enabling perfect control of the boat and protecting her from striking the bank.

There is no question, however, in the minds of the engineers as to the propelling force of the old stern wheel. The thrust of the wheel with its paddle directly against the water gives remarkable efficiency in propelling, but the fuel cost of operation of the old-type boat with its stern wheel is far in excess of the fuel cost of the modern type of boat. To explain this exorbitant cost of the old-type paddle wheel, I will refer to a paper recently read before the Association of Marine Engineers in New York by Mr. R. C. Wilson, a marine engineer of New Orleans. He proved by test that the old paddle-wheel boat in 18 feet of water, with its wheel running 30 revolutions a minute, carrying a certain amount of steamhead, would slow up to about 15 revolutions a minute when the boat was running in 7 feet of water. The schedule showed in this report as follows:

The boat running in 18 feet of water, gradually going into a lesser depth of water, the revolutions were diminished by the following proportions:

About 1½ revolutions to each foot of decrease in the depth of the stream, thereby decreasing the speed of the boat proportionately, and the cost of fuel remaining the same.

In this test the steamhead and all other conditions remained the same in the deep and shallow water. This proves conclusively that where this type of boat is compelled to operate in shallow water, that the cost of fuel in operating is materially more than the cost of operation of a propeller wheel not affected by the shallowness of the stream.

All old steamboat men know too well the old sign of the shaking of the boat as shallow water is approached, and the speed of the boat thereby immediately checked. Mr. Wilson figures this is one of the causes of the shallow-river boat of the old type being more expensive to operate than the propeller wheel. The objections to the propeller wheel are, of course, the obstacles such as snags and sand bars coming in contact with the wheel and the consequent injury of the wheel. This, however, has been partially overcome by the invention of the tunnel-type boat where the wheel is in a tunnel and approximately only 60 per cent submerged when the boat is standing still. The movement of the wheel

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when running lifts the water from in front through the tunnel covering the wheel, permitting it to be propelled in the water it gathers by propulsion, throwing behind the boat a stream of water approximately as large as the diameter of the wheel, thereby pushing the boat forward. This wheel also acts to a limited degree as a dredging or washing device for the removal of sand bars and crossings.

Dredging and snagging.—The many long stretches of several miles each of deep water in the Arkansas River even during the summer months make navigation of this river more feasible, and we are thereby only confronted with the necessity of opening up the crossings to complete a navigable stream. Many of these crossings are extremely short and can be quickly cut by small boats, giving a temporary and narrow channel.

If your honorable body could devise ways and means to control the filling up of the channel of this river at the worst crossings, either by dikes or jetties and some revetment work of the banks at these points, together with several economic dredge boats for keping the crossings open, this appears to me a more feasible plan than that of one or two expensive dredge boats which are materially limited in the territory they can cover, using the present large dredges to make permanent wide channels at points where the revetment and other permanent work has been completed. Mechanical devices have also been invented in the form of hydraulic jacks to spar boats off of sandbars, which will enable the new modern steel craft to pass the crossings with far less difficulty and less dredging work than ever before. The details and plans of this device will be submitted to your honorable body if desired.

It has been brought to our attention that the two dredge boats which have recently been placed on this river by the Board of Engineers are absolutely impractical devices to be used in clearing the channel, it being stated they are too expensive, considering the number of months they can operate during the year, as they are only used in the low-water season. If this is correct, I again request of your honorable body that some device more economically operated and less costly in its construction be placed on this river to keep these crossings open, and that the present dredges be used to do that work which can not be done by the smaller and less expensive device. In this connection it has been proven that a small boat with a propeller wheel, or even a paddle wheel manned by a few men and stationed at a crossing, can materially deepen the channel and cut the crossings, after the river has fallen to its lowest stage, by anchoring the boat with wheel toward crossing and washing the sand by propulsion of the wheel; also equipping snag boats with some steam shovel or dipping device to be used on short crossings, thereby saving extra dredging equipment and also saving of time in the larger boats being taken to short crossings at a great distance away.

If this experience of the old river men is correct, and crossings can be cut by smaller boats, why not place upon this river in connection with the present equipment during the coming two or three years several small boats and make the experiment?

The Arkansas River is termed by some engineers as being in a class by itself. If this is true and the action of this river is unlike other rivers, then it is up to the Government to make different experiments and to utilize different devices than now in use on other rivers.

Freight rates.—The tonnage we have submitted to you to-day from along the Arkansas River is sufficient evidence that the public is vitally interested in the improvement of this river, and the freight-rate situation which has been submitted to this board, showing an absolute discrimination to the towns along this river is sufficient in itself to warrant the most careful consideration of your honorable body. The freight table as submitted on commodities from St. Louis, Louisville, Cincinnati, Nashville, Pittsburgh, Chicago, and New Orleans to Memphis and Little Rock proves conclusively this gross discrimination. In my opinion the only way to obtain redress is by permanent river navigation and the establishment of a permanent common carrier to haul this freight to the Mississippi River points at a rate lower than the railroads are charging and to continue hauling by river, thereby opening up a large territory of undeveloped country and coal mines, which will never be opened until river transportation is provided.

Notice also the division received by the railroads west of Memphis and south of St. Louis in comparison to the division of the freight received by the eastern roads, and you will see on its face gross discrimination to points west of the Mississippi River.

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If the Ouachita River improvement is completed to Camden with one more dam and the White River is made navigable and the Arkansas River materially improved, the entire freight fabroc in the States of Arkansas and Oklahoma will be materially changed, as these three rivers cover sufficient territory of the entire State to make it possible on a short local rail haul in the State for nearly all towns within the State to reach and use these rivers. The agricultural development in Arkansas to-day is impaired on account of the freight fabric on interstate shipments, and grain can not be moved out of this State on an equal rate basis with other sister States.

It is important that a thorough analysis of this freight fabric be made and taken into consideration by your honorable body. Let me here refer you to Exhibits N–1–4, attached hereto, showing particularly that the first-class rate from St. Louis to Little Rock, a distance of 365 miles, is $1, as against a rate from New York to St. Louis, a distance of 985 miles, where the rate is 92½ cents. Also from Buffalo to Memphis, 815 miles, the first-class rate is 91 cents, and from Buffalo to Little Rock, distance of 952 miles, the rate is $1.52 per hundred pounds, or 61 cents for 137 miles, as compared to 91 cents for a distance of 815 miles.

Coal.—The great smokeless coal fields which begin 50 miles north of Little Rock on the Arkansas River, we are told contain 800,000,000 tons of splendid coal, and this coal lies at least 800 miles nearer to tidewater than the Pennsylvania and West Virginia coal which is being shipped via the Ohio and Mississippi Rivers to New Orleans. This appears to me another most important factor in improving the Arkansas River.

Light-draft boats.—Recently we have had submitted to us by two large manufacturers of steamboats that a steel barge can be made especially for the Arkansas River, 160 feet in length, with a 34-foot beam, with water-tight bulkheads and equipped with paddle wheel, drawing 14 to 16 inches of water, light, and for each additional 14 tons placed on theboat she would draw 1 inch of water. This would enable her to carry 280 tons on 36 inches of water, and also enable her to tow two or three barges with 300 tons each on the same water, and if the 4-foot stage of water can be maintained in the Arkansas River from Little Rock to the mouth during a period of 10 months in the year, boat lines with modern equipment can be made to pay handsome profits on the same basis as the Kansas City Missouri River Navigation Co. are carrying freight to-day, namely at 80 per cent of the all-rail rate.

For immediate shipment by river.—The Aluminum Co. of America are moving now about 900 tons of bauxite to East St. Louis per day, this tonnage alone is sufficient to make a handsome profit for a transportation company, if the river were put in shape to navigate.

It is needless for me to refer in detail to the thousands of tons of freight submitted to you to-day in writing which can be moved on the Arkansas River, but I think it of sufficient importance to mention the total tonnage in and out of the city of Little Rock yearly. According to these figures a small proportion of this total amount of freight moved by river would be sufficient tonnage to sustain several boats in regular service.

To this end the Little Rock Chamber of Commerce has appropriated $50,000 of its industrial fund for the subsidizing of boats and assisting in the navigation of the Arkansas River.

Final conclusions.—In the final consideration of the improvement of the Arkansas River we are confronted with the following important facts:

That the Arkansas River has one of the most fertile valleys in the world.

That the agricultural products moving from this valley will increase materially each year as the country is improved and opened up.

That the first mountains of stone which appear as you come from New Orleans, on the Mississippi and Arkansas Rivers, are found at Little Rock, Ark., the first rock on the river being named Little Rock by the original settlers of the valley.

That this stone is unlimited in quantity, lying on the banks of the river.

That several large magnificient quarries are open now at Little Rock on the banks of the river, and from the testimony already submitted hundreds of thousands of tons are available now for immediate shipment to the valley.

That the greatest oil fields in the South are found near Muskogee and Tulsa, Okla.

That the unlimited timber resources of the Arkansas Valley available for river shipment have scarcely been touched.

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That 800,000,000 tons of smokeless and semismokeless coal lies along the Arkansas River Valley, this coal being of a superior quality and approximately 800 miles nearer to tidewater han he smokeless coals of Wes Virginia and Pennsylvania which move by he Ohio River and the Mississippi to New Orleans.

That the rice industry, practically a new industry in Arkansas, now produces over 8,000,000 bushels per year, worth more than $8,000,000. This rice-producing territory lies within a short distance of the river, and the rice can be moved by a short railroad haul and the river to the markets of the world.

That the cities of Pine Bluff, Little Rock, Dardanelle, Ozark, Russellville, Clarksville, Forth Smith, Muskogee, and Tulsa are all thrifty, industrial, and commercial cities and must be supplied with raw materials and finished products manufactured throughout the world.

That the amount of tonnage handled in and out of Little Rock last year amounted to more than 120,000 cars, and independent of all of this tonnage, which is available for river shipment, we are now offered for immediate shipment by the Aluminum Co. of America as much tonnage approximately as was hauled on the Mississippi River during the year 1913 between the mouth of the Ohio and the mouth of the Missouri, as shown on page 102 in the Kansas City statement and brief of the case submitted to this board of engineers October 19, 1915.

I, therefore, state in conclusion and earnestly insist upon your body giving the following and final item your most careful consideration.

Taking into consideration the recent development in the aluminum industry throughout the entire world with the base of supply of this product in the western hemisphere at or near Little Rock, Ark., and with only 176 miles of Arkansas River to improve to complete the waterway, which is to receive at least 250,000 tons per year indefinitely, with the private corporation such as the Aluminum Co. of America having its millions of dollars invested in plants throughout the United States, with its one great reduction plant costing more than $5,000,000 located on this waterway at East St. Louis, Ill., with $1,500,000 invested in terminals at East St. Louis, equipped to receive bauxite by water, with the present rail rate of $2.20 per ton on bauxite from Little Rock, Ark., to East St. Louis, Ill., with every reason to believe that the increase in this rate will bring the rate to $2.40 or more per ton, with the approximate saving to this corporation of $125,000 per annum by moving this bauxite ore by the water route, with the testimony of two representatives of this company given before your honorable body in this case, which testimony shows that this company will move its rough material by water if the river is made navigable, therefore the facts before you should be sufficient guarantee to the Federal Government that the Arkansas River and Mississippi River, over a distance of 800 miles, will be utilized and navigated if the rivers are put in condition to navigate.

Then, again, the empty barges from this movement of bauxite to come from St. Louis, down the Mississippi and up the Arkansas to Little Rock, will enable the manufacturers and shippers in the valley to take advantage of an exceptionally low commodity rate on all commodities moving from the north, east, and west to the southland.

Comparisons.—The three largest cities in Arkansas are Little Rock, Pine Bluff, and Fort Smith, all on the Arkansas River. All were founded and located largely because of the Arkansas River, all grew to be thrifty towns before any railroad came to Arkansas, and in all probability these cities will continue to be the largest cities in Arkansas because of the river facilities, and with the improvement of the river we are asking the Government to make it is only reasonable to assume that the growth of these cities will be greater in the future than it has in the past.

Railroads throughout America have nearly all received subsidies, bonuses, land grants, and other inducements to build into new territory. River projects can only succeed by Federal assistance and improvement. A river channel well improved for navigation should carry as much tonnage as 20 railroads. Most railroads are bonded for over $50,000 per mile, and this amount is the figure placed on the Missouri River improvement project. The Missouri River project is no doubt a worthy one. The citizens at Kansas City have done more for inland navigation than any other community in the United States, and they should be commended for this good work, as the balance of the valley will receive a part of the benefits.

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An expenditure of $20,000,000 is of such magnitude to assure the shippers along the Missouri River of a permanent channel, and we therefore, in behalf of the good people on the Missouri River, also the entire citizenship on inland rivers, trust that the project may be completed as originally planned by Congress.

However, along this line let us call your attention to a few comparisons between the Missouri and the Arkansas Rivers. The Arkansas has the following items of tonnage of which the Missouri River citizens can not boast.

Eight hundred million tons of a superior quality of coal.

Vast forests of virgin timber along the river for a distance of over 500 miles.

Millions of tons of bauxite, of which 1,000 tons per day is shipped to East St. Louis.

In addition to the above, the tonnage available in cotton, cotton seed, and cotton products is enormous.

I beg now to call your attention to the following:

Extracts from the reports of the Board of Army Engineers from 1888 to year 1910.—In Document No. 234, Fiftieth Congress, page 16, we find an estimate of $9,960,000 for the cost of the improvement to give a 3-foot channel at the lowest stage of water from Little Rock to the Canadian River and an estimate of $6,400,000 to give a 4-foot channel from Little Rock to the White River Cut-off, aggregating $16,360,000 for 409 miles of river. The report further states that the State of Arkansas is rapidly developing, as is also the Indian Territory, and both have great possibilities before them. In this connection we desire to call attention to the lapse of almost 30 years since this report was made and to the wonderful development of these two States since that time, and to the thousands of tons of freight now offered at Little Rock, Ark., by the aluminum people, which has never been offered before to the Board of Engineers of the Army and has never before been made a matter of record in any report on the Arkansas River.

In Document No. 150, the Fifty-sixth Congress, page 16, we find the following:

"From the deduced tables of duration of stages given heretofore it will be found that a volume of discharge of about 2,700 feet per second at Little Rock might be assumed as the smallest discharge for ordinary low water, as there were only 320 days in 21 years when the flow was not greater."

We believe from this report that 20 years is sufficient time from which to figure the average flow at Little Rock in the low-water stage, and with this quantity of water we should be able to maintain a 4-foot channel from Little Rock to the mouth of the river practically all the year round if the proper confinement of the channel were established.

In Document No. 150, on page 22, the engineer makes the following statement:

"With regard to the relation and value of the improvement of the river to commerce, it may be said that any piecemeal work, such as has heretofore been provided for, can have hardly any perceptible effect upon commerce; but improvement upon a plan sufficiently comprehensive to assure a safe and reliable means of transportation, adapted to the needs of the commerce demanding such transportation, might in time develop a commerce of large magnitude."

The country in the valley of the river contains much coal, which has as yet been hardly touched, and that alone, if we may judge by the experience in the Monongahela and Kanawha Valleys, would upon the opening of a river route develop a very large industry and commerce. Besides the coal, the principal product of the valley is cotton.

In connection with the above statements we desire again to impress upon your honorable body the new tonnage which is ready for movement by river at Little Rock, namely, 1,000 tons of bauxite ore to move daily to East St. Louis.

I note that in nearly every report of the engineers in the past 40 years that there is always a condition in the statements made relative to commerce justifying the expenditure for improvement, and that also references are made to the newness of the country and the lack of development. We can not refrain from again stating the wonderful development of the Arkansas Valley in the past 30 years.

In the last paragraph on page 22, Document 150, the statement is made as follows:

"An adequate improvement of the river would, as has been shown, cost a large amount of money. Whether the time is opportune and the needs of the

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country sufficiently urgent for the inauguration of such a work are matters for congressional determination. From an engineering standpoint of view the board believes that the improvement of the river is feasible for open-river navigation from its mouth to the mouth of Grand River, the channels decreasing in size from Little Rock upward, but of sufficient dimensions to admit of boats of considerable size, at least as far as Fort Smith; and that if channels of greater depth should be desirable above Little Rock, a depth of 6 feet could be obtained by the construction of locks and dams."

From this statement we assume that there can be no question as to the feasibility of the project.

In Document No. 510, Sixty-first Congress, page 7, the engineer refers to the freight rate on coal out of the southern Illinois fields to several places, such as St. Louis, Chicago, Memphis, Little Rock, Monroe (La.), and Alexandria (La.), and shows the rate per ton-mile to be 4.7 mills, while out of the Arkansas field to Little Rock it is 12 mills a ton-mile, being nearly two-and-one-half times greater to Little Rock from Arkansas fields than from the Illinois fields to the points named.

He further shows that the saving to Little Rock in one year by freight reduction on coal would amount to $86,850.

Attention is also called to page 8, Document No. 510, showing the effect the river would have on the freight rates of cotton and cotton products.

On pages 14 and 15, Document No. 510, the engineer makes the following statement under the following head:

"Improvement by permanent works, assisted by dredging: In this plan of improvement the permanent works will be revetments on caving banks, high dikes or dams to close back channels behind islands and middle bars, and low dikes built to about 8-foot stage at the foot of bends, the object sought being the control of the medium and high stages of the river sufficiently to cause it to flow in one continuous bed not divided by islands and middle bars, and to give a fixed direction and location to the channel over the crossings or shoals over which the desired depth of channel does not obtain by the means outlined above. No contraction of the low-water width by permanent works to produce a scouring of the bottom to increase the low-water depth is contemplated, because the generally sandy nature of the bed of the stream makes extreme contraction of water width undesirable. Since the plan contemplates only holding the banks and giving a fixed direction and location to the river when at medium and higher stages, the permanent works required will not be as extensive as when a complete contraction of low water is sought. Also since the permanent works will give the desired channel depth on many of the crossings, the number of dredges needed will not be as large as when dredging alone is contemplated; therefore, for purpose of estimating the cost of improvement by the combined method of permanent works and dredging, two dredges are taken as the number that will be required."

On page 16, same document, the engineer reports as follows:

"In my report upon the preliminary examination of this river I estimated that 622,000 tons of freight were directly affected by this improvement and that the probable annual savings to the community by reason of an equitable adjustment of freight rates would be about $667,010. No further information has been obtained on this subject, except that the boats referred to in the preliminary examination are now actually in operation. The commercial worth of the country is increasing each year, and in the report referred to I stated that the time is coming when the commercial needs of the Arkansas Valley will warrant a permanent and final improvement of the Arkansas River above Little Rock by the construction of locks and dams, but that at the present time the river is worthy of improvement only to the extent of making a 3½-foot channel depth through ordinary low-water seasons. In view of the continual growth of the country and the length of time in which it takes to complete an improvement of this nature I am of the opinion that the undertaking of the improvement by the combined method mentioned in the preceding paragraphs is warranted now.

"Very respectfully, your obedient servant,

"M. L. WALKER,
"*Major, Corps of Engineers.*

"CHIEF OF ENGINEERS, UNITED STATES ARMY,
"*Washington, D. C.*"

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On page 18, Document No. 510, the engineer makes the following references:

"The board believes, however, that the efforts being made by local interests are deserving of some recognition if any relief or benefits can be afforded at a cost commensurate with these benefits. In a former report on the Arkansas River the board gave as its opinion that any expenditures Congress decided to make for the improvement of this river should be for dredging, and that the work should be undertaken tentatively by the use of two dredges on the reach below Little Rock. The present plan of transporting coal from the vicinity of Ozark, 144 miles above Little Rock, has matured since the date of the report referred to, and a great deal of interest is now manifested in the improvement of the upper reach. It is reasonable also to conclude from a study of present conditions that the ultimate development of commerce on this river will largely be determined by the success of the effort to create a coal trade on this section."

In view of this condition and the fact that the principal objects of the tentative dredging proposition was to demonstrate the effectiveness of improving the channel by this method, it is recommended that the field of operations be extended to Ozark and that the two dredges suggested be used where they will best serve the purpose for which intended. It is believed that this plan will determine the practicability of improving navigation at reasonable cost and will, during the period of trial, aid and encourage navigation."

On page 24, document No. 510, a letter from F. B. T. Hollenberg, of Little Rock, Ark., we note the following statements:

"The amount of money that the Government would have to spend would be many times returned in the simple reduction of these unjust rates and the large tonnage available for the moving of the products and the shipment of manufactured goods to them among a population roughly estimated at one-fourth of the State which is not served by the railroads, or if so, at a considerable hardship in the way of distances and the very highest railroad-traffic rates. It is not my purpose to go into detail or into a lengthy discussion of the matter, still requires some little space to even partially cover this subject; and as briefly as possible I will direct your attention to a few pertinent points."

"It is estimated by Mr. Fox, who has thoroughly studied the question of navigation of the rivers of the United States, that on a proper basis of freight rates the shippers in the vicinity of Little Rock would alone receive the benefits of upward of $1,500,000 a year.

"Were it possible to convert the Arkansas River into a private corporation controlling the waterway, I would not hesitate to say the corporation would be formed within one week's time and would put such engineers and workmen on the river in such a way as to make it navigable at all times. But under the system of our Government that would be impossible, and hence we are absolutely dependent upon the Government to see that such a great waterway as the Arkansas is made navigable."

On page 25, document No. 510, we call especial attention to the complete letter of A. R. Bragg, manager of the Merchants' Freight Bureau:

"DEAR SIR: In the limited time I have had I have prepared and inclose herewith statement showing comparative rates on classes and commodities from New Orleans, Memphis, Louisville, Evansville, Paducah, Owensboro, etc., to Little Rock by rail, also by boat. The rates named by boat are taken from the tariff of the Arkansas River Packet Co. and the Memphis and New Orleans packets and are through rates, but are not used on account of there being no boats in the river above Pine Bluff.

"The comparison on coal shows the rates from mines in Illinois, Alabama, Tennessee, and Georgia to Memphis and to other points, also shows what the railroads are now charging between points in Arkansas on Arkansas-mined coal, and shows what they can haul coal for from mines in Illinois and other territory east of the Mississippi when necessary to do so to meet river competition.

"I am unable to give you the railroad rates on coal from Wheeling, Pittsburgh, and other Ohio and Kanawha River coal territory to Memphis, but am informed that it is about $1.50 per ton. Am also advised that coal can be barged from that territory to Memphis and New Orleans for about 20 cents per ton. This is absolutely a fact; otherwise the railroads would not make the rates they are now making to meet water competition.

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"I have had a practical knowledge of railroad and river rates for 25 years, and believe if the Arkansas river is made navigable and used, as the Mississippi, Ohio, Kanawha, and other rivers, the rates of freight to and from Little Rock, Pine Bluff, Fort Smith, and all other river points will be reduced at least 50 per cent. Such reduction would extend to and from all territory in which the merchants and manufacturers of these cities do business.

"Yours, truly,

"A. R. BRAGG."

Document No. 150, Fifty-sixth Congress, December 7, 1900, on page 21, we find the following relative to the cost of improvement on the Arkansas River from the mouth of the Grand River to the Mississippi:

"On this part of the river, where there is but one point showing any indication of rock, the banks and bed are of extremely soft material, easily eroded. The construction and maintenance of locks and dams would be hazardous and very costly. The board is of the opinion, therefore, that any improvement made should be for open-river navigation. Such improvement could be made, giving channels not less than 300 feet in width, with mean depth of about 5 feet and control depth of about 7 feet in ordinary low water. For a large part of the year such channels would be wider and deeper. Plans are presented for the improvement of this section of the river, with estimates for reaches, viz: Mouth to Pine Bluff, 107 miles; Pine Bluff to Little Rock, 66 miles.

"The estimates of cost are as follows:

Mouth to Pine Bluff, 107 miles:	
501,850 feet of revetment, at $10	$5,018,500
61,800 feet of low dikes, at $10	618,000
23,500 feet of high dikes, at $20	470,000
13,000 feet of abattis, at $2.50	32,500
Total	6,139,000
Pine Bluff to Little Rock, 66 miles:	
219,450 feet of revetment, at $10	2,194,500
43,350 feet of low dikes, at $10	433,500
50,550 feet of high dikes, at $20	1,011,000
29,450 feet of abattis, at $2.50	73,625
Total	3,712,625
Grand total of cost for open-river improvements:	
Mouth to Pine Bluff	6,139,000
Pine Bluff to Little Rock	3,712,625
Little Rock to Dardanelle	4,509,500
Dardanelle to Fort Smith	5,602,725
Fort Smith to Grand River	5,159,875
Total	25,123,725

"In addition to the complete formation and maintenance of channels there is another work that would be absolutely necessary for providing safety of navigation—that is the constant removal, at least for many years, of the snags formed by the enormous quantity of drift that passes down the river. For this purpose a properly equipped light-draft steel-hull snag boat should be provided at a cost of about $75,000 and provision made for its operation and maintenance, which would require about $25,000 per year."

From this recent report we assume that the Arkansas River can be made permanently navigable from Little Rock to the mouth of the river at a cost of less than $10,000,000 and that the upper river can be improved and made navigable from Little Rock to the mouth of the Grand River at approximately $15,000,000.

If the project is a feasible one in its entirety, is it not possible for your honorable body to immediately adopt a permanent policy and plan and improve the river in sections according to the actual tonnage offered for immediate movement, and there can be no question but that an expenditure of $10,000,000 is wholly justifiable in view of the fact that such a vast amount of tonnage is offered for immediate shipment over the lower section of the river up as

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far as Little Rock. This section of the river has been many times referred to as the section to be improved by open-river navigation, and the balance of the river has received favorable reports from the engineers for improvement by locks and dams. If this is the conclusion of your honorable body, we trust that the recent hearing at Little Rock and the evidence in this brief has disclosed sufficiently new development in the valley and sufficient additional tonnage for river shipment to warrant a most careful resurvey of the Arkansas River project and the recommendation of your body for permanent improvement of the river.

Very respectfully,

CARL J. BAER,
Secretary Chamber of Commerce,
Little Rock, Ark.

EXHIBIT N-1.

Comparative statement of all-rail freight rates on classes and commodities from points shown to Memphis, Tenn., and to Little Rock and Pine Bluff, Ark., by Carl J. Baer, secretary Little Rock Chamber of Commerce.

[In cents per 100 pounds.]

Class or commodity.	To—	From— St. Louis, Mo.	Louisville, Ky.	Cincinnati, Ohio.	Nashville, Tenn.	Pittsburgh, Pa.	Chicago, Ill.
First class	Memphis	65	65	75	50	90	85
	Little Rock	100	112.8	121.9	106	152.7	120
Second class	Memphis	50	50	60	38	70	65
	Little Rock	85	95.6	102.6	93	132.4	101
Third class	Memphis	45	45	55	35	59	55
	Little Rock	65	72.2	78.2	60	98.8	77
Fourth class	Memphis	35	35	40	27	46	43
	Little Rock	49	54.8	59.8	52	73.2	60
Axes, any quantity	Memphis	35	35	40	27	46	43
	Little Rock	85	95.6	102.6	93	130	101
Bags, burlap, etc	Memphis	15	15	19	12	23	17
	Little Rock	30	37.2	43.2	24	68.8	43
Candles, any quantity	Memphis	25	25	30	19	32	31
	Little rock	49	54.8	59.9	62	73.2	60
Canned goods	Memphis	20	20	24	15	27	26
		25	28.7	32.7	27	45	32
Canned goods (L. C. L.)	Memphis	35	35	40	27	46	43
	Little Rock	49	54.8	59.8	52	73.2	60
Iron and steel, special (C. L.)	Memphis	13	13	16	8	25	19
	Little Rock	23	26.7	32.7	25	33	30
Iron and steel articles (L. C. L.)	Memphis	20	20	24	13	29½	26
	Little Rock	49	54.8	59.8	52	73.2	60
Lead, pig, bar, sheet, pipe (C. L.)	Memphis	17	17	21	12	24	23
	Little Rock	35	38.7	43.7	37	55.1	43
Paints (C. L.)	Memphis	16	16	20	11	24	22
	Little Rock	28	31.7	35.7	30	48	35
Paints (L. C. L)	Memphis	25	25	30	19	31	.....
	Little Rock	49	54.8	59.8	52	73.2	60
Paper, wrapping, bundles (C. L.)	Memphis	18	18	22	18	26	23
	Little Rock	34	37.7	41.7	36	54	41
Paper bags (C. L.)	Memphis	15	15	20	11	28	21
	Little Rock	34	37.7	41.7	35	54.1	41
Peanuts (C. L.)	Memphis	20	20	24	15	.....	26
	Little Rock	49	55.2	61.2	52	81.8	60
Peanuts (L. C. L.)	Memphis	25	25	40	27	43	.....
	Little Rock	65	72.2	78.2	60	98.8	77
Plumber's material (C. L.)	Memphis	30	30	35	23	39	37
	Little Rock	30	40.7	44.7	39	59.1	44
Roofing and building material, any quantity	Memphis	15	15	19	10	23	21
	Little Rock	27	30.7	34.7	29	47.1	34
Rope, twine, lath	Memphis	25	25	30	19	33	31
	Little Rock	49	54.8	59.8	52	73.2	59
Soap, soap powder (C.L.)	Memphis	13	13	17	8	21	19
	Little Rock	30	33.7	37.7	32	50.1	37
Starch (C. L.)	Memphis	26	20	24	15	.....	17
	Little Rock	27	30.7	34	29	47	34
Tin plate (C. L.)	Memphis	16	16	20	11	25	22
	Little Rock	37	40.7	44.7	39	45.1	44
Vehicles, farm wagons (C. L.)	Memphis	21	21	25	16	28	28
	Little Rock	33	37.7	42.7	36	54.1	42

Pine Bluff takes Little Rock rates.

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EXHIBIT N-2.

NOVEMBER 16, 1915.

DEAR MR. BAER: Agreeable to my promise I hand you herewith a list of the class rates from New York, Boston, and other seaboard territory points to East St. Louis, which will give the rates from those points to East St. Louis under milage, versus rates that you have already in your possession from St. Louis to Little Rock.

From—	First.	Second.	Third.	Fourth.	Fifth.	Sixth.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
New York	92.2	79.9	61.4	43.1	56.9	30.8
Boston	92.2	79.9	61.4	43.1	54.9	30.8
Philadelphia	86.2	79.9	59.4	41.1	34.9	28.8
Baltimore	84.2	71.9	58.4	40.1	33.9	27.8
Albany	76.4	66.2	50.9	35.7	30.6	25.5
Rochester-Syracuse	64.5	55.9	43.0	30.2	25.8	21.6
Cumberland-Williamsport	71.0	61.5	47.3	33.2	28.4	23.7
Buffalo-Pittsburgh	59.3	51.5	39.4	27.2	25.6	19.4
Youngstown	57.3	49.5	37.4	25.3	21.6	17.4
Cleveland	55.3	47.5	35.4	24.3	20.6	16.4

You will note rate from New York to St. Louis is 92½ cents per hundred for about 985 miles, as against rate of $1 per hundred St. Louis to Little Rock, a distance of 365 miles. Practically all westbound rates to Mississippi River crossings versus rates from Mississippi River crossings are about the same ratio.

Yours, truly,

A. R. BRAGG, *Traffic Manager.*

MR. CARL J. BAER,
Secretary Chamber of Commerce, Little Rock, Ark.

EXHIBIT N-3.

Effect of water competition on rail rates at Memphis, Tenn., versus Pine Bluff and Little Rock.

	From—						
	Buffalo, N. Y.	Detroit, Mich.	Cleveland, Ohio.	Dayton, Ohio.	Cincinnati, Ohio.	Kansas City, Mo.	St. Louis, Mo.
Distance to:							
Memphis, Tenn.	815	752	756	548	494	494	285
Pine Bluff and Little Rock.	953	889	893	685	631	514	365
First class rate to:							
Memphis, Tenn.	$0.91	$0.91	$0.91	$0.75	$0.75	$0.80	$0.65
Pine Bluff and Little Rock.	1.527	1.425	1.425	1.242	1.219	1.10	1.00
Rate per ton per mile to:							
Memphis, Tenn.	.0223	.0242	.0241	.0274	.0304	.0331	.0456
Pine Bluff and Little Rock.	.0321	.0321	.0319	.0392	.0386	.0428	.0536
Rate per ton per mile to Memphis applied to mileage to Pine Bluff and Little Rock...	1.002.	1.076	1.075	.987	.968	.849	.763
Reducing present rate to Pine Bluff and Little Rock.....	.466	.35	.35	.405	.26	.251	.237
Saving per ton	$9.30	$7.00	$7.00	$8.10	$5.20	$5.02	$4.74

EXHIBIT N-4.

Statement showing the present rail rates and the boat rates from river points to Pine Bluff, Ark.

From—	First class.		Second class.		Third class.		Fourth class.	
	Rail.	River.	Rail.	River.	Rail.	River.	Rail.	River.
Cincinnati, Ohio	$1.219	$0.75	$1.026	$0.65	$0.782	$0.50	$0.598	$0.40
Louisville, Ky.	1.128	.75	.956	.65	.722	.50	.548	.40
St. Louis, Mo.	1.00	.75	.85	.65	.65	.50	.49	.40
Memphis, Tenn.	.78	.45	.60	.35	.45	.30	.36	.25

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Freight moving from Cincinnati, Louisville, and St. Louis to Pine Bluff is handled by three boat lines and from Memphis by two lines.

The above rates have been effective for only one year, and it will be noted that they are from 20 to 75 per cent lower than the rail rates.

The estimated saving to the Pine Bluff shippers during the past year on traffic from these points alone is $4,000, and the movement is doubling every few months.

TONNAGE AVAILABLE IMMEDIATELY FOR RIVER TRANSPORTATION AT LITTLE ROCK AND AT POINTS BETWEEN LITTLE ROCK AND PINE BLUFF.

After a thorough investigation by J. R. Alexander, one of the largest planters between Pine Bluff and Little Rock, the following tonnage is shown:

	Tons.
24,084 bales of cotton	6,021
Cotton seed	12,042
Supplies, etc., shipped in (estimated)	1,800
Total	19,863

This tonnage is taken from the gin records and does not include seed left on plantation for planting. All of this tonnage should move by river, as these plantations lie along the river bank.

In 1914 there was received at Little Rock 172,291 bales of cotton, and in 1914 there was shipped out of Little Rock 177,029 bales of cotton.

EXHIBIT N–5.

In 1914, 53,107 cars of other commodities were received at Little Rock and 63,193 cars of other commodities shipped out. Total amount, 116,300 carloads.

The commodities in less-than-carload lots have not been included in these figures. One hundred and sixteen thousand three hundred carloads, at 30 tons each, amounts to 3,489,000 tons.

If 5 per cent only of the total tonnage were given to a boat line we would move 174,540 tons per annum by water.

EXHIBIT N–6.

	Receipts, 1914.	Shipments, 1914.
	Cars.	*Cars.*
Bran	571	82
Building material	3,976	10,997
Coal	2,326	246
Cooperage	2,464	1,241
Cotton seed	3,563	78
Cottonseed hulls	49	218
Cottonseed meal	118	1,377
Cottonseed oil	12	305
Feed	912	4,663
Flour	518	114
Furniture	279	275
Hay	1,375	385
Hardware	301	66
Ice	7	282
Live stock	259	61
Liquor	781	13
Logs	829	51
Lumber	2,649	1,315
Machinery	275	107
Meal	186	41
Meat	635	66
Oil	580	129
Produce	1,315	398
Wood	352	122
Merchandise	14,739	31,983
Miscellaneous	9,859	6,556
Corn	1,825	354
Oats	2,292	1,257
Wheat	66	11
Total	53,113	62,793
	Bales.	*Bales.*
Cotton	172,991	177,029

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The Arkansas Brick & Manufacturing Co. offer yearly 60,000 tons for river shipment.

EXHIBIT N-7.

GENTLEMEN: Replying to your request as to the amount of brick that could be shipped via the Arkansas River, in case it is improved so that it can be navigated the year around, will say that our plant has a capcity of about 60,000,000 brick per year. We make common brick, press brick, and paving brick.

A very large amount of this tonnage could be shipped by barge to points along the Mississippi River and down to New Orleans. We estimate that we could give you at least 60,000 tons. The railroad rates to Mississippi River points are prohibitive.

The improvement of the Arkansas River is greatly needed; in fact, it is the only thing that will build up our manufacturing interests.

Yours, truly,

ARKANSAS BRICK & MANUFACTURING CO.,
By W. W. DICKINSON, *President.*

The ARKANSAS RIVER IMPROVEMENT ASSOCIATION,
Little Rock, Ark.

The Big Rock Stone & Construction Co. ship from 100,000 to 300,000 tons riprap per year to Mississippi River points, which could move by river. They also produce 350,000 tons of crushed stone annually.

EXHIBIT N-8.

GENTLEMEN: Replying to yours, requesting us to give you an estimate of the amount of stone and other materials produced by us that could be shipped by river from this point, in case the river was navigable the year round, will say that there is a large amount of riprap used in revetting the banks of the Mississippi River that could be furnished from this point at a less price than it could be secured from any other point, if the river was improved so as to permit the barging of it out. There is shipped annually from this point and from nearby points 100,000 to 300,000 tons of riprap, which goes by rail to Mississippi River points. All of this stone could be barged by river to points where it is being used along the Mississippi River, provided the river was navigable the year round. Enough stone from this point and from points above here on the Arkansas River can be secured to supply the requirements of the Mississippi River. It could be shipped cheaper by barge than by rail.

Besides this, we produce about 350,000 tons of crushed stone yearly. A large part of this could be barged to points along the Arkansas and Mississippi Rivers at less freight cost than is now being charged by rail.

Our crushing plant is situated on the bank of the Arkansas River at the foot of Fort Logan H. Roots. In years past the Government loaded riprap from this point and barged it to Mississippi River points.

We are very much in favor of improving the river, and we hope that when the engineers meet on the 16th instant that they will decide to recommend a sufficient appropriation to be made to make the river navigable the year round. The improvement of the river is imperative if this community is to grow as it should. Our rates are very much higher than the Mississippi River rates, and unless we are placed upon an equality basis we can not expect industries to thrive in this community.

Yours, truly,

BIG ROCK STONE & CONSTRUCTION CO.,
By W. W. DICKINSON, *President.*

The ARKANSAS RIVER IMPROVEMENT ASSOCIATION,
Little Rock, Ark.

The United States Government used on the Mississippi River last year below the mouth of the Arkansas River 122,000 tons stone, and above mouth of Arkansas River 36,000 tons, to Cairo from Little Rock by river.

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EXHIBIT N-9.

[Telegram.]

LITTLE ROCK CHAMBER OF COMMERCE,
Little Rock, Ark.

Stone purchased under contract this year for use below mouth of Arkansas River, 122,000 tons; above mouth of Arkansas River, 36,000 tons. Letter follows.

KINGMAN,
Chief of Engineers.

This we can supply cheaper than any other territory. Our stone quarries are on the banks of the Arkansas River and are inexhaustable. The average amount used by the United States Government on the Mississippi River below Cairo during three years, 1913, 1914, and 1915, is shown in Exhibit N-10.

EXHIBIT N-10.

GENTLEMEN: 1. Complying with request contained in your letter of the 6th instant, addressed to the Department of Commerce, received in this office on the 11th instant, and your telegram of the 12th instant to the War Department, the following is furnished to supplement the brief data contained in telegram of this date. The tabulation shows the contracts entered into during the calendar years 1913, 1914, and 1915. They do not all provide for full delivery during the calendar year in which they were entered into. Contracts furthermore permit an increase or decrease of from 10 to 20 per cent from the quantities specified, and the examination did not extend to the ascertainment of the quantities actually furnished. If any stone was obtained otherwise than by contract, the information here furnished is to that extent also incomplete.

Below mouth of Arkansas River:

1913	58,000 cubic yards. 64,000 tons.
1914	95,000 tons.
1915	122,000 tons.

Above mouth of Arkansas and below mouth of Ohio Rivers:

1913	45,000 tons. 25,000 cubic yards.
1914	40,000 tons. 30,000 cubic yards.
1915	20,000 tons. 16,000 cubic yards.

2. If the above should not be in sufficient detail to serve your purpose, it is suggested that you communicate with the district engineer officers checked on the accompanying list.

By direction of the Chief of Engineers.

Very respectfully,

J. A. WOODRUFF,
Major, Corps of Engineers.

LITTLE ROCK CHAMBER OF COMMERCE,
Mr. Carl J. Baer, Secretary, Little Rock, Ark.

The estimate made by Leo Yount, manager of the log department of the Little Rock Lumber & Manufacturing Co., shows 500,000,000 feet of timber available for transportation on river. This company moved by river last year from 90 miles up above Little Rock to Little Rock, 500,000 feet, or 3,000 tons, and were only operating a few months.

It is a very safe estimate to say 2,000,000 tons of timber should move in the next 10 years to Little Rock, or an average of 200,000 tons per year.

EXHIBIT N-11.

DEAR SIR: In response to your request for an estimate of the timber tributary to the Arkansas River, I beg leave to submit the following opinion:

In my capacity of manager of the log department of the Little Rock Lumber & Manufacturing Co., I have been called upon to investigate this matter for

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my principals. In my opinion there is approximately 350,000,000 feet of timber which is available for transportation on the Arkansas River to Little Rock. In all probabilities there would be 500,000,000, provided river conditions were favorable; but in estimating the amount at 350,000,000, I have made this conservative for the reason that in order to get the 500,000,000 it would be necessary to make the handling of these logs very economical. The 350,000,000 is available with the river in condition to operate from 8 to 10 months a year.

Under present conditions my investigation has satisfied me that 40,000,000 to 50,000,000 feet would be as much as could be handled, and this would leave the most valuable timber in the forest, as only a small portion of hardwood timber will float.

Hardwood logs will weigh on the average close to 12 pounds per foot. This report will show you that with 350,000,000 feet available, it will be possible to handle over 2,000,000 tons.

Yours, very truly,

LEO YOUNT.

Mr. CARL J. BAER,
Secretary Little Rock Chamber of Commerce,
Little Rock, Ark.

The Pulaski Cooperage Co. moved last year, 11,000 tons, and would move 22,000 if the river was made navigable.

EXHIBIT N-12.

DEAR SIR: The Pulaski Cooperage Co. handled via river last year 11,000 tons, but if a good boating stage could be maintained the year round we would ship in to our plant twice the above tonnage.

Yours, truly,

PULASKI COOPERAGE CO.

Mr. CARL J. BAER,
Secretary Arkansas River Improvement Association,
Little Rock, Ark.

The Beebe Stave Co. moved by water last year 7,500 tons.

EXHIBIT N-13.

DEAR SIR: On request of Mr. Longley, we are pleased to report that we handle annually not less than 3,000 cubic cords of stave bolts by barge and boat from points below Little Rock on the Arkansas River. A cord of stave bolts will weigh 5,000 pounds, consequently we handle 7,500 tons of river freight each year by barge and boat.

In addition to this, we raft and run on an average of 1,000,000 feet of logs annually from upriver points.

Trusting this information will serve your purpose, we are,

Very truly, yours,

BEEBE STAVE CO.

Mr. CARL J. BAER,
Secretary Arkansas River Improvement Association,
Little Rock, Ark.

The Alfrey Heading Co. would move approximately 8,000 tons by river each year.

EXHIBIT N-14.

DEAR SIR: In accordance with a request of your representative who called on me this morning, will say that from March 1, 1915, up to November 1, I have received in inbound tonnage at my plant a total of 43,817,600 pounds of rough material. Now, if conditions are right and I could absolutely depend on it, I could obtain fully 35 to 40 per cent of this tonnage from off the river.

Yours, truly,

W. F. ALFREY.

Mr. CARL BAER,
Chamber of Commerce, Little Rock, Ark.

The W. W. Wilson & Wrape Stave Co. could easily move 1,000 tons per year.

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EXHIBIT N–15.

DEAR SIR: In speaking of the river transportation question, will say that with the Arkansas River made navigable the year round, and with proper facilities for handling, we believe that we could easily handle 1,000 tons of timber per year by river transportation, which is not accessible to us now.

We are very much in favor of river transportation on the Arkansas River, as we believe that it would be of much value to a large number of the people of our State, and especially to the people of Little Rock and other cities located on the Arkansas River. Other rivers of Arkansas have been improved and made navigable by Government aid, and it seems strange to us that the Arkansas River, the most important river in our State, should have been overlooked and neglected, as has been the case.

Yours, respectfully,

W. W. WILSON, *President.*

Mr. CARL J. BAER,
Secretary Chamber of Commerce,
Little Rock, Ark.

The Kansas City Hardwood Flooring Co. could easily move 1,000 tons per year.

EXHIBIT N–16.

DEAR SIR: Wish to advise that we estimate that, under favorable conditions; that is, equal freight rates, etc., we could furnish the river transportation company with at least 2,000,000 pounds of tonnage per year. This, of course, could be increased if conditions were made favorable enough.

Yours, very truly,

KANSAS CITY HARDWOOD FLOORING CO.,
By R. G. BRUCE, *Vice President.*

Mr. CARL J. BAER,
Secretary Arkansas River Improvement Association,
Little Rock, Ark.

The following 36 letters from shippers at Little Rock have been received by the Little Rock Chamber of Commerce, relative to usage of the Arkansas River if it were made navigable.

These 36 shippers only represent about 10 per cent of the total number of shippers in the city of Little Rock, and they agree to ship approximately 50,000 tons per year.

DEAR SIR: We have your circular letter of the 9th asking in regard to tonnage which we might be able to give to river transportation. We will be glad to give 2,000,000 pounds a year, provided the rates and service justify it. This might be increased if conditions were favorable.

Yours, truly,

LITTLE ROCK LUMBER & MANUFACTURING CO.,
By D. S. WATROUS, *Secretary-Manager.*

Mr. CARL J. BAER,
Little Rock, Ark.

GENTLEMEN: Acknowledging receipt of your letter of the 9th, in regard to the Arkansas River navigation project, beg to say we are only merchandise brokers, selling in car lots direct to the jobbing trade, therefore we are not in a position to promise any tonnage direct to your association.

Yours, truly,

DEASON & COOPER.

ARKANSAS RIVER IMPROVEMENT ASSOCIATION,
Little Rock, Ark.

DEAR SIR: According to our promise to Mr. Longley of Saturday, we write to you with reference to the approximate amount of freight that could be handled from this company on the Arkansas River under favorable navigation, and after giving the matter considerable thought we believe that we are justified in saying that the tonnage that could be handled by boat running between Little Rock and Memphis with this company would amount to approximately 75 tons. It is, of course, contingent on the boat being able to make regular and scheduled trips.

Yours, truly,

INTERNATIONAL HARVESTER CO. OF AMERICA.

Mr. CARL J. BAER,
Secretary Chamber of Commerce, Little Rock, Ark.

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DEAR SIR: This is to advise that under favorable conditions we will probably handle 100 tons freight on Arkansas River boats.

Yours, truly,

COOPER-DICKINSON GROCERY CO.

Mr. CARL J. BAER,
Chamber of Commerce, Little Rock, Ark.

NOVEMBER 5, 1915.

DEAR SIR: For your information will state that we handle out of St. Louis from 25 to 30 cars annually, and out of Nashville, Tenn., 50 or more cars annually.

We are heartily in accord with the movement to open the river traffic to Little Rock, and fully appreciate what that would mean to shippers and consumers in this connection.

BRANDON & TURNER CO.

Mr. CARL J. BAER,
Chamber of Commerce, Little Rock, Ark.

DEAR SIR: Referring to your letter of the 9th. We probably handle 3,000 tons per year, and, if the river rates offered any inducement, we would probably handle half of it that way.

Yours, truly,

CENTRAL SUPPLY CO.

Mr. CARL J. BAER,
Secretary Arkansas River Improvement Association,
Little Rock, Ark.

DEAR SIR: Answering your letter of the 9th instant concerning the tonnage that we are receiving in the way of freight, we wish to say that our income freight is, in round numbers, 1,000 tons, and if we will get river navigation on the Arkansas we can safely further say that if we can save 20 per cent on the freight charges that two-thirds of that tonnage can be hauled by water.

Yours, very truly,

THE GUS BLASS DRY GOODS CO.

Mr. CARL J. BAER,
Chamber of Commerce, Little Rock, Ark.

DEAR SIR: In conversation with your Mr. Longley to-day he requested that we advise the chamber of commerce approximately the tonnage we could move by river if we had the proper facilities. Both our inbound and outbound tonnage would be subject to considerable fluctuation. The inbound tonnage would be governed very largely by the size of the cotton crop, but we feel safe in estimating that we would average 1,000 tons of seed annually by river if we had the proper facilities. We use during a season on an average of 2,500 tons of coal, which, no doubt, could be handled to better advantage under favorable conditions by water.

Our outbound tonnage would probably fluctuate even more than our inbound tonnage, varying from a minimum of 1,000 to a maximum of 5,000 tons. At the present moment we have 600 tons to move to ship side for export through New Orleans for November shipment alone, and, with the export demand good, this tonnage would be probably increased to 2,000 to 2,500 tons. Under normal conditions abroad a larger portion of our lint production goes for export. Our normal production would be 2,500 bales, with an average of 50 per cent of that for river movement.

At the present moment, however, we neither receive nor ship a single pound of freight by river.

Yours, truly,

ROSE CITY COTTON OIL MILL.

Mr. CARL J. BAER,
Chamber of Commerce, Little Rock, Ark.

NOVEMBER 10, 1915.

DEAR SIR: In reference to tonnage we might receive by boat, will say a greater portion of our goods comes all rail from northern and southeastern points. However, we could probably use 25 tons or more a year by boat.

Yours, truly,

BOWSER FURNITURE CO.

Mr. CARL J. BAER, *Chamber of Commerce, Little Rock, Ark.*

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DEAR SIR: Replying to yours of the 9th, and also fulfilling a promise made to Mr. Longley when he called upon us personally, we herewith submit a statement of our knowledge and experience as to river shipping.

For the last few years on account of the lack of river shipping facilities we have only had brought in by river freight 1,000 to 1,500 tons of cotton seed per year. Several years ago when facilities were better we received from 5,000 to 8,000 tons by river per year, and if the river channel was improved between Pine Bluff and Fort Smith until boats could run regularly in the early fall, we could easily turn 8,000 to 10,000 tons of freight through the river route. Under present difficult conditions, existing on account of the channel being so shallow, the boats can not run regular enough to make a living and charge reasonable freights. If the channel could be deepened and straightened so that we could depend upon boats making regular trips once or twice each week, there would be an immense tonnage available during all seasons of the year between Pine Bluff and Fort Smith, and I suppose above Fort Smith as far as Muskogee; but in speaking of from Pine Bluff and Fort Smith, I speak from personal knowledge.

I hope I may be able to attend the convention on the 16th, but whether I am there or not, if this letter can be of any service to you, you are welcome to use it.

Yours, very truly,

LITTLE ROCK COTTON OIL CO.

Mr. CARL J. BAER,
Secretary Arkansas River Improvement Association,
Little Rock, Ark.

DEAR SIR: Mr. Longley has called in at our office twice in reference to your letter of the 9th.

It would be rather difficult for us to give you some intelligent idea as to the amount of tonnage we could handle by boat lines, either to or out of Little Rock.

We use in our manufacturing business all native lumber. We do, however, buy considerable window glass, also paints such as white lead and linseed oil. The latter two items come mostly from St. Louis, and we should say that we handle in that commodity somewhere between 400 and 500 tons per annum which, of course, we would be glad to handle by river if we could, out of St. Louis or near-by points.

As to the outbound, it would all depend upon how far up the river the boats would go, but I should say we would handle 50 to 100 tons.

Yours, very truly,

CHAS. T. ABELES & CO.

Mr. CARL J. BAER,
Secretary Arkansas River Improvement Association,
Little Rock, Ark.

DEAR SIR: In view of the fact that there will be held in this city to-morrow a meeting of the United States engineers, I wish to state that should we have river navigation it would be possible for me to handle by boat tonnage approximately 250 to 300 tons per annum.

Yours, truly,

J. W. MAST.

Mr. CARL J. BAER, *Chamber of Commerce, Little Rock, Ark.*

DEAR SIR: Answering yours of the 9th, will say that we receive during the course of a year on the average of from 20 to 40 cars of freight in addition to probably 10 cars in local shipments. We think that one-half of this could move by boat. The minimum weight per car on the class of goods we ship runs from 12 to 23 tons.

Yours, truly,

PETTIT-GALLOWAY CO.

Mr. CARL J. BAER,
Secretary Chamber of Commerce, Little Rock, Ark.

DEAR SIR: In connection with the Arkansas River transportation proposition, wish to advise that I am in correspondence now with parties who hope to soon complete arrangements to ship their coal by river from the Denning field in

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Franklin and Johnson Counties. If this coal proposition works out, it will mean the transportation of some 20,000 tons of coal by river to Little Rock and vicinity.

Yours, truly,

R. H. McNAIR.

Mr. CARL J. BAER,
Secretary Arkansas River Improvement Association,
Little Rock, Ark.

DEAR SIR: Replying to yours of the 9th instant, will state that we have received during the year 1914 and to this date 200 cars of merchandise from points originating east of the Mississippi River. We would be glad to divert as much as possible to any river connection at Memphis, and are ready to cooperate with you in any project of this kind.

Yours, truly,

DOYLE-KIDD DRY GOODS CO.

Mr. CARL J. BAER,
Secretary Arkansas River Improvement Association,
Little Rock, Ark.

DEAR SIR: Replying to your favor of the 9th, beg to advise that if the water rate were 20 per cent lower than the rail rate, we could give you approximately 100 carloads, averaging from 12,000 to 16,000 pounds, out of State shipments; while we receive about 25 cars, averaging 12,000 pounds minimum per car, and about 20 to 25 cars, averaging from 30,000 to 40,000 pounds per car.

This is the exclusive of local in and out bound shipments.

Trusting this is the information wanted, and wishing you success, we are,

Yours, very truly,

THE JOP-PA MATTRESS CO.

Mr. CARL J. BAER,
Secretary Arkansas River Improvement Association,
Little Rock, Ark.

DEAR SIR: In line with questions asked by your representative, Mr. Longley, beg to advise that the probable amount of freight that we could ship by water under favorable conditions would be approximately 150 tons. We have not had the advantage of river shipments, and therefore our estimate will necessarily have to be conservative and purely an opinion.

Trusting that this movement will secure this much-needed water transportation, I am,

Yours, truly,

THE MURRAY MACHINERY CO.,
A. R. PANNELL, *Manager.*

Mr. CARL J. BAER,
Secretary Arkansas River Improvement Association,
Little Rock, Ark.

DEAR SIR: In compliance with your request I desire to state that our firm is heartily in sympathy with the movement of river transportation, and assure you that if they can offer us satisfactory facilities in the way of service, rates, and the expediting delivery of our freight we shall be very glad indeed to favor the transportation company with as much business as possible.

Wishing you much success in this most laudable undertaking, we are,

Yours, truly,

PFEIFER BROS.

Mr. CARL BAER,
Chamber of Commerce,
Little Rock, Ark.

DEAR SIR: In reference to river navigation: For your information we would say that the Norton-Berger Shoe Co. freight account will average about $11,000 each year, of which under favorable conditions 75 per cent could be brought in here by boat, provided the service was dependable, which, of course, it would have to be in order to have them come that way.

Yours, truly,

NORTON-BERGER SHOE CO.

Mr. CARL J. BAER,
Chamber of Commerce,
Little Rock, Ark.

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DEAR SIR: In answer to your letter with reference to tonnage for the Arkansas River navigation project will state we can handle approximately 250 tons per year.

Yours, very truly,

ARKANSAS CARPET & FURNITURE CO.

Mr. CARL BAER,
Secretary Chamber of Commerce,
Little Rock, Ark.

DEAR SIR: As per your conversation with our Mr. Tedford, we wish to advise that if we can get good river service we will ship about 400 tons freight per annum from Memphis.

Yours, truly,

WILLIAM L. TEDFORD.

Mr. CARL J. BAER,
Chamber of Commerce,
Little Rock, Ark.

DEAR SIR: I notice there will be a meeting on the 16th to consider the river traffic with Government officials.

I beg to advise that I figure there are 3,000 tons of cotton seed from our customers each year that is hauled from 10 to 15 miles to railroad points which could be handled by river with only a few miles haul. We figure it would be a great advantage to every farmer on the Arkansas River if this stream was navigable the entire year.

I sincerely trust the Government will give their assistance.

Yours, very truly,

THE SOUTHERN COTTON OIL CO.

Mr. CARL J. BAER,
Secretary Chamber of Commerce,
Little Rock, Ark.

DEAR SIR: One of your representatives was in our office a few days ago asking in reference to the probable tonnage we could give in support of the regular line of boats on the Arkansas River, and we write to advise we have no way of definitely determining, but think we would be safe in estimating same to be at least 350,000 to 400,000 pounds a year.

Trusting this information will be of some service, we are,

Yours, very truly,

C. J. LINCOLN CO.

Mr. CARL J. BAER,
Secretary Chamber of Commerce,
Little Rock, Ark.

DEAR SIR: Replying to your inquiry as to the benefits to be derived from open navigation on the Arkansas River, in my opinion from 29 years' experience in business in Little Rock, Ark., the benefits would surely be very many to all the people all along the line. For instance, take the items of field seeds and grain that are largely transported from St. Louis, Mo., Louisville, Ky., Cincinnati, Ohio, Evansville, Ind., Memphis, Tenn., New Orleans La., and other river points. These items will not mix in carload shipments by rail, but by river can be transported at a much less rate, thereby securing to the farmer his seeds at a much lower price. Any detail information I have you are welcome to by only the asking for the same.

Yours for the building up of the productive end of the line, viz, the farmers and planters, I am,

Yours, very truly,

EDMOND CRAIG.

Mr. CARL J. BAER,
Secretary Chamber of Commerce,
Little Rock, Ark.

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LETTER OF MR. L. M. GUTHRIE, ET AL.

OZARK, ARK., *November 15, 1915.*

DEAR SIR: We, a committee appointed by the Commercial Club of Ozark, Ark., to compile data showing the probable tonnage available to a regular line of river boats, beg leave to submit the following:

Cotton	bales	12,000
Cotton seed	tons	30,000
Hay	do	200
Peanuts	do	144
Irish potatoes	barrels	6,000
Sweet potatoes	bushels	50,000
Apples	do	27,000
Peaches	quarts	960,000
Coal, accessible to Arkansas River	tons	2,400,000
Stone, for riprap Mississippi River	do	120,000

In addition to riprap stone we have within a mile of Ozark a very superior building stone in practically unlimited quantity.

Considering the fact that the demand for riprap stone is in all probability to be continuous until the millions of tons required for the Mississippi are supplied, and the further fact that the eastern parts of this State as well as the whole coastal plain are without building stone of any sort, it is only a question of freight rates that prevents our shipping an immense tonnage of building stone down the river.

Not being in position to obtain data as to general merchandise and other shipments received and shipped during the past year we do not undertake to furnish this information.

We have an undeveloped county that awaits cheaper freight rates on crude materials to reach its highest development. Provide the low rates of river transportation, and we will provide a generous share of tonnage to make it profitable.

Give us a chance to trade our apples for bananas, our railroad ties for hemp and jute, our cotton for sugar. Give us a chance at the Panama Canal; we helped to pay for it just the same as did the folks along the Ohio. Our great hardwood forests are rotting because wood is cheap and freights are high. Give us a chance to send a part of the wood Europe is going to need in rebuilding.

We have got a lot of stuff South America needs; give us a chance to trade with her. We have got a downhill run toward the world's markets, but the river is full of snags; help us get them out, we want to use that river.

Very respectfully,

MONTA ADAMS,
A. D. REYNOLDS,
L. M. GUTHRIE,
Committee.

Mr. CARL J. BAER,
Secretary Chamber of Commerce, Little Rock, Ark.

LETTER OF REYNOLDS REALITY CO.

OZARK, ARK., *November 15, 1915.*

GENTLEMEN: Not having an opportunity to meet with the committee that was appointed to gather information for the benefit of river navigation from Ozark and Franklin County, and of which committee I have the honor to be a member, I have undertaken to get up some data of shipments that could be controlled by reliable river transportation, with the following results:

From Ozark and Webb City:		
Cotton	bales	12,000
Cotton seed	tons	30,000
Hay	do	200
Peanuts	do	144
Irish potatoes	barrels	8,000
Sweet potatoes	bushels	50,000
Apples	barrels	9,000
From Franklin County: Peaches	cans	960,000
Accessible to Arkansas River: Coal	tons	2,400,000

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Not being in position to get the merchandise and other shipments received at these points during the year, I do not undertake to furnish this information.

Very respectfully submitted,

A. D. REYNOLDS.

OZARK COMMERCIAL CLUB, *Ozark, Ark.*

ESTIMATE OF NUMBER OF CARS OF FREIGHT SHIPPED TO MORRILLTON, CONWAY COUNTY, ARK.

Flour	150	Vehicles and implements	20
Feed	150	Automobiles	10
Meal	50	Machinery	15
Sugar	25	Nails and wire	20
Oats	20	Dry goods, groceries, etc	400
Potatoes	10	Lumber	75
Bagging and ties	25	Oils and gasoline	40
Seed, rye	2	Drugs	15
Lard	30	Hardware	15
Meat	50	Brick and sand	50
Soap	6	Lime	15
Vinegar	3	Cement	10
Sugar	3	Tiling	10
Sirups	7	Hay	50
Cane and millet seed	3	Bagging and ties used at compress	5
Salt	30	Logs	50
Rice	2	Staves	20
Fruit jars	3	Cotton seed by boat	30
Oranges	2	Cotton seed by rail	200
Bananas	5	Furniture	10
Miscellaneous groceries	375	Cotton into compress, 20,000 bales.	
Coal	200		
Fertilizer	100		

Total of 51,220 tons per year.

ESTIMATE OF NUMBER OF CARS OF FREIGHT SHIPPED OUT OF MORRILLTON, ARK.

Cotton seed	100	Cattle	100
Meal and hulls	300	Hogs	10
Cottonseed oil	20	Hay	20
Logs	100	Potatoes	5
Staves	10	Railroad ties	50
Junk	10	Fertilizer	30
Fruit	100	Rock	50
Strawberry plants	15	Cotton, 40,000 bales.	

Total tons per year shipped out of Morrillton, 28,400.

ESTIMATE OF NUMBER OF CARS OF FREIGHT SHIPPED TO PLUMERVILLE, ARK.

Meal and hulls	25	Miscellaneous cars	100

Total, 2,500 tons.

ESTIMATE OF NUMBER OF CARS SHIPPED OUT OF PLUMERVILLE, ARK.

Cotton seed	50	Rock	50
Logs and staves	50	Cotton, 4,000 bales.	

Total, 4,000 tons.

ESTIMATE OF NUMBER OF CARS OF FREIGHT SHIPPED OUT OF BLACKVILLE, ARK.

Cotton seed	5	Logs	50

Total, 1,100 tons.

Estimate of number of cars of cotton, cotton seed, logs, railroad ties, and staves shipped from south side of river in Conway County and loaded at ferry, Houston and Adona, 100 cars.

W. E. DELONG,

Member Board of Governors Arkansas River Improvement Association, Morrillton, Ark.

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STATEMENT OF MR. H. F. AUTEN, PRESIDENT OF THE ARKANSAS RIVER IMPROVEMENT ASSOCIATION, OF LITTLE ROCK, ARK., AND PRESIDENT OF THE LITTLE ROCK PACKET CO.

SIRS: In compliance with your request for information as to the value of the Arkansas River as a means of transportation and commerce I herewith submit the following for your consideration:

While the Arkansas River Improvement Association is for the development of the commerce of both Arkansas and Oklahoma, as the State of Oklahoma has prepared and submitted to your honorable board their complete statements, through the commercial bodies of Muskogee and Tulsa, I will confine this statement to the State of Arkansas, with which I am familiar.

Arkansas in undeveloped resources is one of the richest States in the Union. It has within its borders not only a great volume of present commerce, but resources lie here waiting development far beyond its present commerce. The coal fields of Arkansas lying along the Arkansas River on both sides above Little Rock cover a territory approximately 100 miles square, and the coal underlying these fields varies in thickness from 2 to 9 feet. This coal field, so vast as to be spoken of as exhaustless, is lying practically dormant for want of transportation at reasonable cost. This coal is smokeless and ranges in fixed carbon from 75 to 84 per cent and has been by the United States Government pronounced equal to the famous Pocahontas coal used by the United States so extensively on its ocean fleets. The demand for such coal as this is practicably inexhaustible, and our coal fields, if the Arkansas River is made navigable, lie 1,000 miles nearer tidewater than the Pocahontas coal fields. In addition to this, with the Arkansas River made navigable, we have the markets of Little Rock, Pine Bluff, Memphis, New Orleans, and Vicksburg, and many other cities. It is not easy at first glance to decide why this high-grade coal in such quantities has not been mined and put upon the market, but a very slight investigation discloses the cause at once. The railroads penetrating these fields are charging rates for hauling the same two or three times as great as railroads hauling coal in more-favored communities. The freight rate from our coal fields, ranging from 60 to 125 miles from Little Rock, are from 90 cents to $1.10 per ton, which, added to the cost of mining, makes the coal entirely prohibitive for manufacturing purposes. In the northern Central States, composed of Illinois, Indiana, and surrounding States, the rate for mine-run coal is 60 cents per ton for the first hundred miles, and slack coal is hauled a similar distance for from 30 to 40 cents per ton. Without going further, this explains the reasons why our vast coal fields lie undeveloped and will lie undeveloped until river transportation is an established fact. It also explains why we have practically no manufacturing done here. With river transportation, coal should be brought to Little Rock from our coal fields by boat at not to exceed 30 cents per ton on barges, which would permit this State to enter into active development and engage extensively in manufacturing the raw materials which are now lying useless.

Timber.—Arkansas has greater forests of yellow pine and hardwood than almost any other State in the Union. Take, for instance, our hardwoods, of which Arkansas has more than any State in the Union, and Little Rock, at the very center, has only three hardwood mills manufacturing this product, while Memphis, Tenn., on the Mississippi River, with river transportation and river rates, has 46; and yet we are located right in the heart of the hardwood-timber belt and would have short hauls to the factories and mills, while Memphis is out of the belt and has a much longer haul. The secret is that Memphis, with river rates, is able to manufacture sucessfully, while Little Rock, in Arkansas, without river rates, finds it impossible to manufacture at all. The three mills now located in Little Rock have been located here within the last 30 months, and it is yet a problem whether or not they can survive or whether they will be strangled by high freight rates. The world has been and is demanding this hardwood timber, and river transportation would not only give us a quick and easy way for handling it, but would give us such reasonable rates as would make the development of our lumber industry successful.

It will be recognized at once that the materials which I have mentioned are those which legitimately belong to river transportation. They are bulky, low-priced commodities, which the railroad can not profitably handle, and which ought naturally to be handled by boats, leaving the railroads to handle the higher priced freight, which could afford to pay the higher rates.

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Bauxite.—Arkansas has located about 15 miles from Little Rock vast fields of bauxite ore, which have been in recent years partially opened up and developed by the Aluminum Co. of America. The reduction of bauxite is a very expensive process, requiring a large amount of capital invested in reduction plants and employing a large number of high-priced skilled labor and large quantities of coal for fuel. The reduction plant to which the bauxite from Arkansas is shipped for reduction is now located at East St. Louis, Ill. The history of the organization of this plant will illustrate the point I am calling attention to. The plant in question cost something like $6,000,000 or $7,000,000 and consumes from 600 to 1,000 tons of bauxite per day. The distance between the bauxite fields to East St. Louis is about 360 miles. As reasonable people, the Aluminum Co. of America, when they began to develop this Arkansas field of bauxite, looked to Little Rock or its locality as the natural site for the reduction plant. They found that the railroad rates for hauling coal from the coal fields adjacent to Little Rock were so high as to make the cost of production prohibitive, and they, therefore, decided to haul the raw bauxite 360 miles in order to get into a coal field which would produce cheap coal, because of lower rates of transportation on the Mississippi River. The plant was therefore taken away from Arkansas and our State left undeveloped and another great industry lost for Arkansas because we had no river transportation. The railroad rates in the recent past have been raised on the shipment of bauxite from $1.80 per ton to $2.20 a ton to East St. Louis, with the probability of still further increase. The present rate of $2.20, so I am advised, is almost, if not quite, prohibitive, and the Aluminum Co. of America must either resort to river transportation to move its product from Little Rock, Ark., to East St. Louis or abandon the Arkansas fields of bauxite. In view of this condition, the Aluminum Co. of America has procured large fields of bauxite on tidewater in both France and South America, and they claim that should they not get river transportation in Arkansas to connect with the Mississippi, they can bring bauxite from France and South America by water and land it at their docks in East St. Louis at less cost than to bring it from Arkansas under present freight rates. It will thus be seen that unless we can get river transportation this great industry in Arkansas will be strangled like the coal and hardwood lumber industries. With river transportation the Aluminum Co. of America agrees to ship 400,000 tons of bauxite per year from Little Rock to East St. Louis by boat, and on returning haul coal from the cheap Illinois fields and merchandise from St. Louis and Memphis to Pine Bluff and Little Rock, which would give us cheap coal for manufacturing purposes and cheap transportation for the merchandise which we consume in such vast quantities. I have myself seen steaming coal delivered on the docks in East St. Louis from the Illinois mines at 45 cents per ton, including cost of coal and transportation, and the average price during the year in East St. Louis for steaming coal delivered on the docks is 70 or 85 cents per ton. This coal could be landed in Little Rock by boat far below the cost at which Arkansas coal is now being delivered.

The Aluminum Co. now employ in this State about 600 men in mining and shipping the bauxite and would in the future increase this very much. We are advised by the company that it will be necessary almost immediately to locate another reduction plant, which would probably cost in the neighborhood of $5,000,000 or $6,000,000 and employ a large number of men. With transportation on the Arkansas River the bauxite from Little Rock would be hauled by water to East St. Louis, and the boats returning would haul the cheap coal of Illinois back to Little Rock to supply fuel for the new reduction plant, which could then be erected in Arkansas, where it properly belongs. Had we cheap coal delivered here the same condition which would permit the Aluminum Co. of America to construct its new reduction plant here would permit other kinds of manufacturing to be installed and conducted here sucessfully, and the people of Arkansas would then find profitable employment, and the State would awaken from its dormant condition and make rapid progress in development. The supply of bauxite in Arkansas is sufficient to last, under present conditions, for probably four or five generations.

What will become of our bauxite and our coal and our timber without river transportation? The answer is simple. These industries will lie dormant and our people will be without employment and our State will remain poor for lack of reasonable transportation to bring about development.

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Clays.—We are just entering upon a period of concrete construction. The Baltimore fire a few years ago demonstrated the fact that steel construction was not fireproof, and within the last five years the development of concrete construction is so great as to be marvelous, and it is safe to predict at the present rate of increase that 10 years from this time the cement business will be as great or greater than the steel business. Arkansas and Oklahoma have the great Portland cement clays of the South and West. The fields, while of great extent, are practically valueless to-day for want of cheap transportation. Like coal, bauxite, and timber, cement is a low-class freight, which can only be handled profitably by water. We have also extensive fields of granite, marble, and stones of the various kinds for all kinds of construction work; all bulky and naturally belong to water transportation. With reasonable river transportation all these fields could be developed and the 2,000,000 people of Arkansas made prosperous and happy. The agricultural products of Arkansas are matters of Government record, and I do not mean to refer to them except briefly. In 1914 Arkansas produced more than 1,000,000 bales of cotton, which, at the present price of cotton, would bring in $75,000,000 and furnish a tonnage of 250,000. Three-fifths of this cotton is tributary to the Arkansas River. From the same crop is produced 500,000 tons of cotton seed, three-fifths of which is tributary to the Arkansas River, and the agricultural development of the State is just in its infancy. Less than 25 per cent of the tillable lands of Arkansas are under cultivation, and we may reasonably expect that the development of farm lands will increase rapidly with cheap transportation. Add to our cotton 5,000,000 bushels of rice, all raised along the Arkansas River, the hay, corn, oats, and other products, all of which are bulky material and would naturally be handled by river, and we have a commerce for the Arkansas River from this State scarcely equaled in any like-sized territory along any river in the world.

Why the river has not been used.—The question is frequently asked, Why do you not use the Arkansas River during the seven to nine months in the year when there is supposedly enough water for navigation? This at first glance in the face of constantly decreasing commerce on the river would seem to be a serious question, but when reference is made to the practical side of navigation it explains itself very quickly. People having quantities of merchandise or other products to be shipped to markets abroad, or to be brought to Little Rock from other markets, expect to have them transported at regular intervals, in in order to meet their contracts, and while it is true that the Arkansas River at times during several months of the year has water enough to carry considerable transportation, the fact remains that the river is constantly rising or falling even during the period of high water and sand bars forming, so that in its present condition no shipper can be sure that goods which he orders concentrated at Memphis, St. Louis, or Little Rock, to be moved by boat 30 days hence will find the river in condition for transportation. A navigation company under present conditions of the river, even in high water, can not assure any shipper that a boat can make a trip from Little Rock to the mouth of the river or back again two or four weeks hence; consequently, neither the navigation company can take the risk of engaging in transporting the goods, nor can the owner of the goods take the risk of having his property tied up and fail to make delivery at the proper time.

Five years ago the citizens of Little Rock organized the Little Rock Packet Co. for the purpose of operating boats and carrying commerce on the Arkansas River from Little Rock to its mouth. I have been a member of that board of directors from its organization, and for the three years last past have been president of the company. We have demonstrated several things from our experience.

First. That with an open stream permitting boats to run even seven or eight months in the year transportation on the river would be exceedingly profitable at freight rates 20 to 25 per cent less than present railroad rates.

Second. The sudden building up of sand bars with the rise and fall of the stream has demonstrated that it is not safe to make any contract for more than 10 to 20 days in the future for carrying commerce, and that there is not 1 shipper in 20 that can avail himself of such a short-time contract, as it usually requires from 30 to 90 days for shippers to concentrate freight at Memphis, or from Mississippi River points. The shipper is, therefore, compelled to ship by rail, no matter how much greater the rates may be. While we could make a nice profit on a successful trip, our boats were so frequently tied up by sand bars in the river that we had to abandon the idea of making contracts in advance and have sold our boats until such time as there is a channel in the Arkansas River

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reasonably maintained, which will enable us to make contracts for carrying freight.

Improvement of the river must precede commerce.—The sand bars in the Arkansas River frequently form when the river is at its highest stage, consequently there is no time in the year when a navigation company could safely undertake to transport freight more than a few days in advance; and it is, therefore, absolutely impossible to expect any transportation company to undertake to contract for hauling freight until the channel of the river is so prepared that shippers can have reasonable assurance that transportation will be regular and effective.

Cost of improving the river.—We do not advocate a hit-and-miss policy in the improvement of the Arkansas River. It would be a mistaken policy for the Government to depend upon dredge boats alone in opening and maintaining a channel, which may fill again within a short time, if this were the only improvement contemplated. There is no doubt the Engineer Department of the United States Government can work out a plan, possibly with dikes and jetties, which will construct a permanent channel, or something akin to a permanent channel, in the Arkansas River, from the city of Little Rock to its mouth, and this once done the cost of maintenance would be reduced to a minimum. The original cost would be paid but once and the annual maintenance being thus reduced would seem to be a sound business policy. The question arises, Would the commerce of the States of Arkansas and Oklahoma be sufficient to justify the United States Government in spending enough money to make a permanent channel? I recall that recently the United States Government made an appropriation of $35,000,000 to build a piece of railroad in one portion of Alaska, a country which is sparsely settled and whose business will be confined largely to mining, which is at the present time in its incipiency, and in a country which is frozen up nearly two-thirds of each year. If it is permissible for the Government to spend $35,000,000 to build a railroad under such conditions, it certainly would be permissible for the Government to spend a like sum to build a road through the rich territory of the States of Arkansas and Oklahoma, with their 4,000,000 inhabitants, with undeveloped resources greater than any like territory in Alaska.

It would probably cost from $20,000,000 to $25,000,000 to construct a railroad through the State of Arkansas, basing this cost on the capitalization of the St. Louis, Iron Mountain & Southern Railroad, and such a railroad when constructed would only permit one company to haul commerce thereover, and yet private capital finds it profitable to spend this vast sum in such a project. If such a project can be made to pay by private individuals, then there can be no question of the propriety of the United States Government spending a like amount to open a natural watercourse through the State of Arkansas, on which many companies could carry the commerce of this section to the world. We do not favor a hand-to-mouth policy on the Arkansas River. The people of this great territory, with the vast resourses lying dormant which the world is demanding, such as coal, bauxite, timber, clay, cotton, hay, rice, wheat, oats, and corn, have the right to ask of the United States Government the same assistance and protection which it has granted to so many other localities and to give us transportation which will not only build up the Southwest but will save to shipper and consumer alike a large per cent of present transportation charges and permit manufacturing, mining, and other lines of industry to develop. It will, therefore, be seen that while the present commerce on the Arkansas River is practically nothing, the commerce which would be on the river were the river in condition to be used, would be probably not less than from three-fourths of a million to a million tons per year from the time transportation on the river was assured. We have at the very outset the Aluminum Co. of America, which offers to contract to transport from Little Rock to East St. Louis 400,000 tons of freight per year, and the Aluminum Co. of America is a concern fully capable of carrying out its contract. Added to this would be the coal and general merchandise to be returned from St. Louis for the Arkansas River trade, which is estimated at not less than 200,000 tons per year. To this may be added the coal from our own coal fields, hardwood and pine timbers, clays, granite, and different kinds of stone, in addition to agricultural products, and it will be seen at a glance that an estimate of a million tons per year is within reasonable bounds.

Will the river be used?—The reason the Aluminum Co. of America offers the transportation of 400,000 tons per year is because it can be handled by river cheaper than by railroad, and what is true of bauxite is also true of all the bulkier classes of freight which I have named, and human nature is so constituted that men will make contracts which are most profitable to them;

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hence if the river was navigable, the products which I have mentioned would be handled by river instead of by railroad. In this we do not mean that all the products would be handled thus, for it is likely that the railroads would reduce their rates on such commodities and handle some part of this commerce, but increased shipping facilities and lower rates would mean more rapid development and more rapid increase in commerce, and there would be enough to tax both railroads and river shipping facilities.

Respectfully submitted.

H. F. AUTEN.

The BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

PUBLIC HEARING OF THE BOARD OF ENGINEERS ON RIVERS AND HARBORS WITH REFERENCE TO THE IMPROVEMENT OF THE "ARKANSAS RIVER, ARK. AND OKLA.," CALLED FOR BY THE RIVER AND HARBOR ACT OF MARCH 4, 1915, HELD AT THE CHAMBER OF COMMERCE, LITTLE ROCK, ARK., NOVEMBER 16, 1915, AT 10 O'CLOCK A. M.

Col. W. M. Black, Corps of Engineers, chairman.
Col. F. V. Abbot, Corps of Engineers.
Col. John Biddle, Corps of Engineers.
Col. Harry Taylor, Corps of Engineers.
Col. H. C. Newcomer, Corps of Engineers.
Lieut. Col. C. A. F. Flagler, Corps of Engineers.

Col. BLACK. Gentlemen, please come to order. This hearing is the result of the following section of the river and harbor act of March 4, 1915: "Sec. 14. That the following projects now under improvement shall be reexamined, in accordance with the law for the original examination of rivers and harbors, with a view to obtaining reports whether the adopted projects shall be modified or the improvement abandoned * * * the Arkansas River, Arkansas and Oklahoma * * *."

On August 7 the following notice was sent out: "Examination of Arkansas River, Ark. and Okla. Sir: The report on the examination of the project for improvement of Arkansas River, Ark. and Okla., made in compliance with section 14 of the river and harbor act of March 4, 1915, has been reviewed by the Board of Engineers for Rivers and Harbors, whose conclusions are unfavorable."

I suppose you know that there is a certain procedure followed in all cases of this kind, of examination and surveys. The order for the examination is sent to the district officer; he makes the examination and reports, through his division engineer, who makes such comment as he sees fit. These papers are then sent to Washington and are referred to this board by law. They report on it, and their report, with all the other papers, go to the Chief of Engineers, and are transmitted by the Secretary of War to Congress, with such recommendations as the Chief of Engineers and the Secretary of War see fit to make. In the cases of unfavorable recommendations or unfavorable findings, a notice is always sent to interested parties, as it is termed, in order that they may make an appeal, so that the question may be fully heard and determined before the final report is made to Congress; and, you know, Congress takes final action according as it sees fit. Whether the report be favorable or unfavorable, Congress is entirely free to act exactly as it desires. We are simply a body that they have appointed to make examinations and give to them our best judgment in the matter.

Excerpts from the board's report are as follows: "It will be seen that the commerce has been decreasing and now amounts to only about 55,000 tons, a large part of which consists of forest products, which can usually be handled at medium and high stages without improvement. Gradually, the large vessels which formerly navigated this river have disappeared and the little business that is now done is by a few small boats operating over short distances. The history of navigation on this river is similar to that of many other shallow western rivers. In early days, when these waterways afforded the best, if not the only means of transportation, they were used to the limit of their capacity. Their improvement was undertaken in aid of the general progress and development of a pioneer country, and the expenditures brought abundant returns and were fully justified. Transportation follows largely the lines of least resistance, and it was found advantageous to abandon the river with the coming of rail-

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roads, and this has been done almost to the complete desertion of this waterway, although the adjacent country has greatly developed and the amount of transportation required is many times what it was when navigation flourished years ago. Experience has shown that it is impracticable to secure any permanent improvement of the navigable capacity of the river except at a cost incommensurate with the present benefits. The least expensive method is snagging, and as it happens, this is essentially the first step to be taken in connection with any method of improvement and is necessary to permit the use of the natural channel even for the small present commerce. It seems desirable to keep the river open in aid of this commerce and in the hope held by many that there will be a revival of traffic on these waterways in the future. In view of the above, the board concurs with the division engineer, and recommends legislation authorizing the transfer of the dredges, without charge to some other improvement and a modification of the existing project, so as to limit the work to snagging the river from its mouth to Ozark, at an annual cost of about $35,000, until such time as the needs of navigation shall warrant more extensive operations." We were requested to have a public hearing here in the city of Little Rock so that interested parties might have an opportunity to submit any statements, facts, or arguments deemed pertinent concerning the necessity for continuing the project, and, in accordance, notice was sent out and advertised. A copy of the notice sent out is not here this morning but may be seen at the office of the district engineer at Little Rock, as also may be seen there the list of the persons to whom the notice was sent, and I think you will find that all publicity possible was given to it.

We will now be very glad, indeed, to hear from you gentlemen any statement you desire to make, and I will ask Mr. Auten to take charge of the hearing and call up the speakers in succession in order that the case may be presented with some degree of sequence and order. When you speak, gentlemen, please speak clearly so that the stenographer will be able to record all that you say, for that record forms a part of the permanent record in this case, and may be published. In addition to that, please state clearly your name and what corporation or business you represent.

Mr. H. F. AUTEN. Gentlemen of the board, it is a real pleasure which the men of Little Rock and of Arkansas have in welcoming you here to make an investigation of the Arkansas River. Not only that, but we welcome you here because we are pleased to show you the courtesy for which our city and our State have been known for many years, and we are glad to entertain you; but, beyond that, we are glad that you are here for a serious, everyday, workaday purpose, to work out the problem which means the salvation of three or four millions of people along this Arkansas River in this valley.

For more than a quarter of a century, Senator Clarke, and, among other men, myself, in a small way, have been working to develop the State of Arkansas, and you will hear from these men to-day the efforts which have been put forth, from the different witnesses who will appear before you.

In reply to the senior member's suggestion of the notice, we beg to say that the notice was ample. It was received by our people and passed up and down the river and every one has had ample notice through the courtesy that you have tendered us, so we are here to-day with such information as we have been able to procure, and we will present it as best we may.

We have with us this morning at this hearing a gentleman of whom the State of Arkansas is proud, one who has been an honor to the United States Senate, the chairman of the Committee on Commerce of the United States Senate, the committee which deals with this great question with which you gentlemen are also connected; and I desire first to ask Senator Clarke to present this matter in his own way to you, as he may see fit.

Senator JAMES P. CLARKE. I expect to have the privilege of speaking about this matter before your board in Washington City, therefore I shall not consume any time here covering matters that can be more intelligently covered by what may be termed the witnesses, because, I take it for granted, the prime purpose of this investigation is not to be lectured about matters of policy or the professional aspects of the question, but to deal with such facts as would have a tendency to show that the report of the district engineer is erroneous.

The criticism I have to make of the report is that it starts at the beginning and ignores all that has been heretofore done in connection with this river. It has been repeatedly surveyed by the ablest men in the engineering service of the United States. In 1900 a report was made by Col. Stickney, captain then,

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now Gen. Sibert, and Capt. McGregor. It went over the river in all its aspects practically as far back as the history of the river. Its rapidity and attributes are discussed, and it is the last work on the subject—as thorough as could be made now. The larger project mentioned in the report called for an expenditure of $22,000,000, which was out of the question, but there were alternate suggestions which are worthy of attention. In the light of that report and the possibilities of improvement, river interests became active and again called the matter to the attention of the War Department, and another board was sent down here. They made a recommendation that two dredge boats be provided of modern type, especially adapted to this particular work. It was conceded that the larger project, while professionally feasible, was not commercially justified. Gen. Marshall took the matter up, went over it, and made his recommendations, in which he cordially approved that project, taking the river up in sections, beginning with the section from Little Rock to the mouth, and making an effort in a practical way to dredge out a channel of 3½ or 4 or 5 feet from here to the mouth of the river. It was one of those things which could not be so definitely forecasted by mere professional opinion, but it was worthy of practical exploitation up to that point, and if the river was to be made navigable at all within the limits of permissible cost it was through the agency of this dredging process. The dredges were authorized, I think, in 1907; they have been at work for a year. I doubt if they have done 30 days' continuous, actual work for which they were constructed. But I give that as an opinion. I know they were not continuously employed, because the water has been up and down. It was either too low or too high; something was the matter that the plant was not capable of being used. The river is made up of pools. There are shallow places in it which prevented them getting from one place to another. This filling had been going on for 30 years, and the hope has been that the dredging process would equalize the bottom somewhat, so that boats could pass over it, and once they began to travel it it would be more easily dredged than it would be when they first undertook dredging it. It was realized that this couldn't be done at once, but would require a reasonable amount of time for that purpose.

Now, as I say, my criticism of this report is that, without a word of comment, it just casts aside all that has been done by the able men of the department who adopted as a policy the proposition of improving this river in sections; that the dredging process would give us a navigable depth to the Mississippi River, then it was reasonable to show that they could carry it up the river as far as Ozark. I think the subsequent report suggested as much. I suppose, and have supposed since, and am going to continue to suppose, unless this board knows something to the contrary, that there isn't anything to justify such a sudden, radical departure from the policy adopted by the department, because I take it that while the personnel of the board changes it isn't the policy of the board that comes in to revolutionize everything that everybody has theretofore done. The length of time that the boats have been on the river has been so brief and the amount of work that they have had an opportunity of doing has been so meager that I don't believe a conscientious body of public officials, such as I know this board to be, will say that because we had only 55,000 tons on the river last year the whole thing must go by the board. The very fact that we are calling upon the Government to improve the river shows it isn't in navigable condition now. The boats are not running up and down it. That goes without saying. Of course, the scheme presents itself in several aspects—the question of policy, how far the United States Government wants to go with improvement; the professional question of how far it is feasible, that's for you gentlemen to say; the commercial question, that's for the people to say. Would you patronize the river if you had it? Have you got anything to patronize it with? Is there any reason for it? The Government isn't called upon to expend money to make theoretical rivers. I am thoroughly committed to reform along that line.

There are millions of dollars scattered over the United States not doing any good except to improve the political prospects of some party. I have been aware that, whether from oversight or whatever it is, there comes up to our committee recommendations that seem to me to be discriminatory. Some things that are not half so worthy as other things are recommended where others things are not recommended. If it is the policy of this administration and of this board to adopt a more rational, businesslike system, I shall aid them in their efforts to do so, and if, after a fair test, the Arkansas River falls under the condemnation of any rule that has been adopted and will be uniformerly applied, I will stand as religiously for that as any other; but, when I am

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backed by such reports as the two I have called your attention to—and the policy was reasonable of digging out this stretch of 173 miles of river from here to the Mississippi River—I believe I am justified in showing some earnestness and protesting with some emphasis against the report made, and which is now under consideration by you. They have not tried to dredge it. They have accounted for that in various ways. There may be professional reasons why those dredges have not been more actively employed than they have been, but it would be in the nature of an outrage to take them away from there now with so little work done, and in the face of the showing that I am satisfied those in charge of the commercial aspect of the project will make.

The recommendations of the board, approved by Gen. Marshall, have just begun to be applied. They knew the condition of the river then, they knew the condition of its commerce, and the hope was expressed that they could so improve it that there could be a commercial tie established between here and the Mississippi River, and ultimately up the river. It's a pretty good river from here down, it's a pretty good river above—as rivers go. Changes are taking place in the rivers, but boats are being adapted to more shallow stages. A great many reforms are taking place. Those who are in a position to speak authoritatively tell you the tonnage is here. One fact is that the Mississippi River is the western boundary of the eastern freight zone. Little Rock is just within the western zone. Those are not the terms, but they definitely describe it. Immediately you cross that line, the freight rates come up from 30 to 300 per cent. Memphis has an advantage of this town of 30 per cent, although they are practically in the same territory. If this river was in a boatable condition, the wholesalers or jobbers of this town could either get the benefit of the Memphis rate or have their freight shipped to Memphis over the railroad and get the benefit of the river rate and bring it around here by boat for a small fraction of what they are compelled to pay.

This city as a distributing point for merchandise and that kind of freight the year around is peculiarly well suited for experimentation along that line, and I do not believe that the project, which has been recommended by Gen. Marshall and his associates, is an extravagant one. The two boats are here; they are paid for; they are at work; $193,000 was set aside last year for their operation, and that was done by the engineers and not by Congress. The filibusters defeated the appropriations. The bill was passed by the committees, but it was impossible to get it out under the "pork-barrel" system. If the shaking up that that business has gotten in the last two years or in the last two Congresses will result in a more careful discrimination in these objects, I think a very substantial result has come from it. I don't want to charge anybody with unfair discrimination against us, but we do know that we haven't been getting what we were entitled to, and I don't think that, after years of effort—the board having adopted a plan as modest as that one—that somebody, who has never made his presence known in this city when he made his report—it wasn't made by Maj. Putnam, as we are advised, or by Mr. Van Frank, but some other official equally as conscientious, I suppose. I am not saying anything about that, but he didn't consult local interests, as far as I am able to determine, and he either wrote it in his office or some similar place. Of course, if he took the history of the stream as laid down in current histories, his statement is correct. I am not combating the official, but I am combating the proposition that it isn't a river that is navigable. The appeal we make to Congress is for improvement.

When I get to Washington I will go into certain phases of this matter more fully and if there is anything further that I can submit to this board I will be glad to submit it.

Col. BLACK. The board will be very glad to see you then, Senator.

Mr. AUTEN. There are delegations here from several cities along the river. I will ask Pine Bluff, which is represented here by a delegation of about 15 or 20 men, to have their representative come forward. I will say that, inasmuch as there are about five or six districts to be heard from, it will be necessary for us to limit our time to probably 30 minutes to each city. Will that be sufficient, Mr. Bloom?

Mr. E. B. BLOOM. I think so.

Mr. AUTEN. This is Mr. Bloom, of the city of Pine Bluff, representing the chamber of commerce of the city of Pine Bluff, which is just down the river.

Mr. E. B. BLOOM. Gentlemen, I take it it will not be necessary for me to take up but just a minute or two of your time to state the facts that we have, and I presume that is what you gentlemen want.

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I want to say, to start with, that Pine Bluff, of course, is deeply interested in river navigation, and we have had in navigation down there, continuously for two or three years, two boats, one, the steamer *Lightwood*, that runs from Pine Bluff to the mouth of the river regularly once a week and return. At the mouth of the river she connects with the Memphis Packet Co.—the Lee Line of steamboats. Coming this way, or west, we have the steamer *Ralph Hicks*, that makes two to three trips a week. Those boats have been fairly well patronized, but not so much as they would have been had we had permanent and dependable river navigation.

I have, at the suggestion of the president of the Arkansas River Association, attempted to compile some tonnage statistics, and in doing so I have only gone to those merchants and planters whom I believed we could absolutely rely on for the tonnage that they state they will give to steamboats provided there is certainty of river navigation. We will be glad, of course, to submit these letters to the board—file them with the board, if they desire them—and, upon investigation, I believe they will conclude that the statements made by those merchants and planters can be absolutely relied on.

Just as a sample of the letters we have taken, I would be glad to read one from the Union Seed & Fertilizer Co., of Pine Bluff, who have oil mills throughout nearly all of the Southern States. They write as follows:

Mr. E. B. BLOOM,
Secretary Chamber of Commerce,
Pine Bluff, Ark.

DEAR SIR: Replying to your several requests asking for information regarding the tonnage of cotton seed and cottonseed products by boat on the Arkansas River in and out of Pine Bluff, we have to say that during the season of 1913–14 we received 600 tons of seed by river, and during the season of 1914–15 only 400 tons by the same source. However, had there been sufficient water, or had the channel been in shape to receive the boat regularly, we would have more than doubled this tonnage, but owing to the poor river service we were compelled to haul this seed by wagon and rail instead of by water. If the river was in condition to transport freight from Pine Bluff to Little Rock and from Pine Bluff to the Mississippi River, it would give us a chance to use the water route for all of our export business from both our Little Rock and Pine Bluff mills, but, as the condition has been so bad for several years past, it has been impossible to handle freight through this source.

UNION SEED & FERTILIZER CO.,
By ITS MANAGER.

Compiling the tonnage statistics from just such letters and promises as that, we are prepared to say that the tonnage out of Pine Bluff—in and out—would amount to 147,322 tons per annum. That consists of cotton and cottonseed products, furniture, hardwood, and the regular lines of merchandise.

I believe that's about all that I can say that would be of any benefit to the board, except to add that I don't believe the dredge-boat system has been given a proper opportunity to show what it could do in the Arkansas River. I make that statement not from personal knowledge of just what the boats have done, but from personal knowledge of having seen those boats come to the wharf at Pine Bluff some time in October, I think—one of them—1914, and the other one along about January, 1915. Those two boats then remained at the wharf in Pine Bluff until August, 1915, with apparently nearly full crews on both boats. During the month of August they were sent down the river with, as I understand, full crews. At a little meeting held at the Chamber of Commerce of Pine Bluff in August, which Maj. Markham, of Memphis, attended, he stated that up to that time of the appropriation that had last been made by Congress for this work $90,000 had been expended. Of course, that struck us as being an expenditure of money for boats that were laying at the wharf. If that's true, then I feel that I am justified in saying that the dredge boats so far haven't had an opportunity to show what they can do.

Now, Mr. Chairman, we have with us Mr. Taylor, the traffic manager of our organization, and I would be glad to have him present to you a few things in regard to the saving of freights, should the channel of the Arkansas River be opened.

Mr. AUTEN. Mr. Taylor will please come forward. He is traffic manager of the chamber of commerce, Pine Bluff.

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Mr. W. M. TAYLOR. Mr. Chairman and members of the board, I have prepared several exhibits and I will just file them with the board's stenographer so he can use them without writing them down. (See Exhibits A, B, C, D, and E.) But I would like to recite a few of these figures to show some of the effects of water competition on rail rates. I have prepared one exhibit here that shows the present rail rates and the boat rates from river points to Pine Bluff. Now, as Mr. Bloom told you, we only have the one boat that runs from Rosedale, Miss., up the river to Pine Bluff. It is practically impossible under the present condition of the river to operate north of Pine Bluff, but this boat has been in continuous operation. It makes a trip every week and has failed just one week this year in making the trip, due, I think, to the high water making it practically impossible to make its way landings. The great majority of its freight, of course, comes to Pine Bluff at the present time. We are restricted to traffic that moves from river points, and in moving it from river points—Memphis, St. Louis, Cincinnati, Louisville, and Evansville, possibly—it has to move over three boat lines to get into Pine Bluff; therefore the cost of operation is considerable. The present rail rate from Cincinnati is $1.219—these are the first-class rates—and the river rate is 75 cents; the second-class rate by rail is $1.026, and the river rate is 65 cents; the third class, 78.2 cents as against 50 cents; the fourth class, 59.8 as against 40 cents. From Memphis the rail rate is 70 cents as against 45 cents; second class, 60 cents as against 35 cents; third class, 45 cents as against 30 cents; fourth class, 36 cents as against 25 cents. The river rates run from 20 to 75 per cent lower than the rail rates, and we have estimated that the saving to Pine Bluff in the last year—and the last year has been a considerable increase over the tonnage that moved previously, due to the fact that the boat is now operated possibly in a little different manner from what it was before—that we have saved about $4,000 in the tonnage that comes to Pine Bluff alone. Of course, if the work was stopped on the river and the boat had to go out of business we would lose that.

I have prepared another exhibit that shows the class rates from St. Louis to Pine Bluff and Little Rock. They are the same. Pine Bluff and Little Rock are on an equality in the matter of freight rates from all of the points of origin or manufacturing centers.

The first-class rate for 358 miles by rail from St. Louis is $1 to Little Rock and Pine Bluff. In comparison with that rate for the same distance, to show the discrimination that exists in this country as regards freight rates and the evident necessity for some compelling force to give us a method of getting commodities in here that will put us on an equality with the river country, I want to compare that rate of $1 for 350 miles from St. Louis to Pine Bluff with various rates. To Topeka, Kans., 345 miles, the first-class rate is 80 cents; to Emporia, Kans., 392 miles, 96 cents; to Lincoln, Nebr., 491 miles, 65 cents; to St. Paul, Minn., 576 miles, 63 cents; to Duluth, Minn., 686 miles, 78 cents; to Mobile, Ala., 866 miles, 90 cents; to Pensacola, Fla., 761 miles, 90 cents; to New Orleans, La., 701 miles, 90 cents. I have simply read the first-class rates, but the exhibit shows all the class rates, and I have also given here on this the tariff reference that can be used in referring to the tariffs, should care to take it up. For instance, the Interstate Commerce Commission, in deciding a case as to what the rates should be from St. Paul to points in North and South Dakota, territory that is practically the same, as regards the methods and cost of handling transportation, as it is from St. Louis to this territory—the commission decided that for a distance of 360 miles, the same as from St. Louis to Pine Bluff and Little Rock, the first-class rate should be 89 cents, as against our rate of $1. They also decided a case of transportation from Iowa to Kansas and Nebraska points, 360 miles, 86 cents, as against our $1 rate. The rate in the State of Texas, made by the Texas railroad commission, where the cost of transportation is evidently more than it is in this territory, for the same distance is 80 cents; in the State of Oklahoma, 85 cents. In the State of Arkansas the first-class rate is 82 cents.

Of course there are many arguments, pro and con, as to the reasonableness or unreasonableness of these rates, per se, as they put it, but that shows, anyhow, that we are evidently discriminated against in that fashion.

I have another exhibit that shows possibly the effect of water competition on rail rates more than any other, and while it may not be plainly understood from a reading of it by yourselves, I can explain it in this way: I have taken the territories from which we get practically 90 per cent of what we consume

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in this country—from Buffalo, Detroit, Cleveland, Dayton, Cincinnati, Kansas City, and St. Louis. The distance, for instance, from Buffalo to Memphis is 815 miles. The distance from Buffalo to Pine Bluff and Little Rock is 952 miles. The first-class rate from Buffalo to Memphis is 91 cents per 100; the first-class rate to Pine Bluff and Little Rock is $1.527 per 100. For a difference in distance of 137 miles, the difference in the rate is about 63 cents. The rate per ton per mile from Buffalo to Memphis is $2.23; the rate per ton per mile to Pine Bluff and Little Rock is $3.20, showing that the Mississippi River absolutely controls the basis of the making of freight rates. Now if there was no Mississippi River, or, in other words, if Arkansas River navigation had the same effect and force as the Mississippi has had at Memphis, and you were to apply the rate per ton per mile to Pine Bluff and Little Rock as is applied to Memphis, our first-class rate from Buffalo to Little Rock and Pine Bluff would be reduced 46½ cents per 100, or $9.30 per ton less than it is now—a saving, mind you, of $9.30 a ton in a haul of 135 miles. The same thing from Detroit shows that we would save 35 cents per 100, or $7 a ton; from Cleveland, 35 cents per 100, or $7 a ton; from Dayton, Ohio, 40½ cents per 100, or $8.10 a ton; from Cincinnati, Ohio, 26 cents per 100, or $5.20 per ton; from Kansas City, 25.1 cents per 100, or $5.02 per ton; from St. Louis, about 24 cents per 100, or $4.74 per ton.

On October 1, 1914, the traffic bureau of the Chamber of Commerce of Pine Bluff filed with the Interstate Commerce Commission a petition asking that the commission require all boat lines that run from Memphis—we use two boat lines at the present time—we asked the commission to require the railroads that run from the east and originating territory to join in with the boat lines from Memphis to Pine Bluff in the establishment of through rates. That would mean that a man at Buffalo or Pittsburgh, or Atlanta, Ga., could go into the freight depot and bill his his goods direct to Pine Bluff at a river-and-rail rate, whereas he bills it now all-rail. They have that same arrangement to New York and many other points. We want the same rate to Pine Bluff territory. We believe if we could get that arrangement that would open up to us a way to move traffic by the river and naturally secure lower freight rates by reason of lower cost of transportation over the river.

The reason we filed that petition asking the commission to require the boat people and the railroads to admit that they were common carriers alike was because of the section of the Panama Canal act that amended section 6 of the act to regulate commerce, giving the commission authority to require this to be done and to say that a boat line was a common carrier. We have had this case heard by the commission. We went to considerable expense. We set forth in that petition to the commission all of the various aspects regarding the movement, the physical connections at Memphis and at Rosedale, Miss., and we have put it up to them in oral argument at Washington. We have gone to all that expense.

We were backed up in our application by various decisions that were made immediately after the passage of the Panama Canal act on various applications that were made, for instance, the Decatur Navigation Co. *v.* Louisville & Nashville Railroad, the Chattanooga Packet Co. *v.* Illinois Central Railroad Co., the Tampa Board of Trade *v.* Louisville & Nashville Railroad et al., the Bowling Green Business Men's Club *v.* Evansville & Bowling Green Packet Co., and the most recent case that has come up in connection with the same is the Kansas City Missouri River Navigation Co. *v.* Chesapeake & Ohio Railway. In that case, which was exactly similar to ours, the commission decided in favor of the Missouri River Navigation Co., giving them through rates through to the coast on export grain. This case, as I say, has been submitted to the commission, but we are yet without a decision; but, of course, if the commission were to learn that work had ceased on the river, naturally they wouldn't feel justified in requiring the carriers to join in with a boat line that was physically unable to operate. We have estimated if we could have this highway opened up, this natural artery of commerce, that we would save at Pine Bluff, as a distributing center for the surrounding territory—and we supply 16 counties—possibly 20 per cent in freight charges, a saving to the community served by Pine Bluff as a jobbing center—this in only an estimate—of from $50,000 to $100,000 per year. For instance, to tell you what it would mean, or to give you an idea, the present rail rate from New York City to Pine Bluff, first-class, is $1.70. The ocean-and-rail is $1.27. That is the difference between all-rail rates and water-and-rail rates—$1.70 as against $1.27.

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I have attached hereto a copy of the petition we filed in the case, together with a statement of the various freight rates applying and the various tariffs as compared with the boat rates.

Col. NEWCOMER. May I ask you, in that connection, if that decision is favorable, would the rates from Pine Bluff to those points be the sum of the local rates or be less than the sum of the locals?

Mr. TAYLOR. That is possibly a point on which the decision will hinge. For instance, from Pittsburgh to Pine Bluff, the through rail rate is $1.50. It is a fraction over $1.50. What does the railroad company get to Memphis out of that $1.50? They get less than their local to Memphis. We are asking that they take that same proportion of the the through rate and add it to the boat rate to determine the through river-and-rail rate, necessarily making a lower rail-and-water rate than the present rail rate.

This steamer *Lightwood* that we are operating and are doing everything in the world to give tonnage to, we are able to give it less tonnage by reason of the necessity of operating over three boat lines. But in the last year this boat, which has a capacity of 150 to 200 tons—a wooden boat—some of them call it the *Driftwood*, but it's a mighty good little boat, at that—it has a draft of only 30 inches, and it takes a very light draft boat to operate now—it has made 50 trips up and down the river in the last year, 100 trips altogether—it has handled 12 tons of brick, 1,400 tons of cotton, 1,000 tons of cotton seed, 15 tons of cotton-seed meal, 190 tons of corn, 100 tons of hay, 600 tons of lumber, 4,588 tons of merchandise, 180 tons of oats, 40 tons of potatoes, 1,600 tons of rice; a total of 10,125 tons during the last year.

Col. NEWCOMER. Is the boat rate from Memphis to Pine Bluff, involving two boats, less than the rail rate?

Mr. TAYLOR. I have all of those figures tabulated here for you.

Col. NEWCOMER. The point I had in mind was, is there any substantial increase in shipments from Memphis to Pine Bluff by boats?

Mr. TAYLOR. It is very substantial. In fact, all of the larger merchants in town ship all of their less-than-carload stuff by boat. Of course, they have to take into consideration the longer time it takes to move. The comparison of the rates is this: The first-class rate by boat is 45 as against 70 by rail.

Col. NEWCOMER. Is that less-than-carload?

Mr. TAYLOR. Yes; taking the class rates. The first-class rate always applies on less-than-carload commodities. The second-class rate is 40 as against 60.

Col. NEWCOMER. You gave those before?

Mr. TAYLOR. Yes, sir.

Col. NEWCOMER. But, then, I understood you to say that on commodity rates, for instance, the boat rate was greater than the carload rate?

Mr. TAYLOR. Yes; it can't handle—the reason for that is, as you well know, that a carload shipment is loaded by the man that ships it and it's unloaded by the consignee, but the boat people have got to load everything and unload everything, and they can't compete with the very low carload rates under present conditions. Undoubtedly if this boat had plenty of channel to handle out of Pine Bluff the product that can move out and go all the way to Memphis without stopping, it could bring back stuff at one-third the cost it will bring it back now.

Col. BLACK. What channel depth do you think will enable you to operate?

Mr. TAYLOR. I am not competent to state.

Col. BLACK. Is there anyone who is?

Mr. TAYLOR. Yes, sir; we have several practical steamboat men with us.

Col. TAYLOR. Your expectation is, if the improved channel is made, it will meet with the lowering of freight rates by rail?

Mr. TAYLOR. No, sir; we have no desire at all to lower the freight rates by rail. Of course, we would gladly welcome that.

Col. TAYLOR. You spoke of the rates being discriminatory awhile ago—your rates very much higher than those to other places. You would like to have your rail rates reduced?

Mr. TAYLOR. Oh, undoubtedly.

Col. TAYLOR. That's really what you are getting at?

Mr. TAYLOR. Yes, sir.

Col. BLACK. Be careful about that answer. I don't think you intended to say what you did.

Mr. TAYLOR. At the same time we would intend to use this river as a common carrier, the same as we now use the railroads, in the shipment of through routes. Just as I tried to explain, whatever the effect is on these rates from

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St. Louis, Memphis, or any other points that are two or three times as far away as Little Rock or Pine Bluff—whatever that effect is, it establishes rates that are 80 cents as compared with our $1, or 65 cents as compared with our $1, and we can lay it on to nothing at all except the force of river—possible potential river—competition.

Col. FLAGLER. I would like to ask one question. In speaking of the discrimination in rates from St. Louis here you quoted a number of cases where they have lower rates into territory where there was no water competition?

Mr. TAYLOR. Yes.

Col. FLAGLER. What is your idea of the reason for the discrimination against you in favor of those places where there is no water competition?

Mr. TAYLOR. There are a thousand and one reasons, possibly, for nearly every rate; and the longer a man studies rates the more he learns about them and the less he thinks he knows. But, take any one of those points—take Topeka, Kans.—I should judge that the reason for that lower rate from St. Louis for the greater distance is that possibly the cost of operation from St. Louis to Topeka is lower; but is it lower in such proportion? The rate from St. Louis to Kansas City, 65 cents per 100 pounds, as compared with our $1, was in the past forced by river competition, and that has some effect or bearing upon the rate to Topeka. Possibly the railroad that operates from St. Louis to Kansas City moves through Topeka. One of the lines does. Perhaps that has some effect on what the rate is to some intermediate point.

Col. NEWCOMER. Doesn't the volume of traffic movement affect the rate?

Mr. TAYLOR. Yes, sir.

Col. TAYLOR. The financial condition of the railroads down here isn't such as to indicate that they are getting rich at the present rates.

Mr. TAYLOR. We have no control over the things that happen in connection with the Rock Island and the New Haven. They have done many things that we shouldn't be called on to suffer for. We have undoubtedly been made to suffer and to pay for a great many sins. In connection with that rate to Topeka and those other rates we firmly believe that the Iron Mountain Railroad has made the people of Arkansas pay for the low rates through that country.

Col. ABBOT. Then, I understood you to make a still further proposition, and that is, supposing that the railroad rates remain as they are, that you would be able to ship by river to Memphis and take advantage of the lower rates that Memphis has to the East, and gain over what you can do now shipping by rail through Memphis to the East. I understood you to make that statement.

Mr. TAYLOR. In connection with this case that we have before the commission?

Col. ABBOT. No; in connection with the use of the river—that you could actually take your goods from Pine Bluff and ship them by river to Memphis and then transfer to rail and get a through rate in that way, even if the railroads and steamboats did not give joint rates, that would be less than you now have to pay by shipping all the way from Pine Bluff to the East by rail.

Mr. TAYLOR. I have made no comparison on that, but I should say this: That if a boat were justified and would haul sufficient tonnage to Memphis and haul sufficient tonnage from Memphis back, that that boat could make low rates enough to be able to break down that through rate or to make lower rates by reason of the very low rates out of Memphis.

Col. ABBOT. You say to "break down that rate." You prefer to ship by rail, but if they wouldn't break down, you would ship by river; is that the position you want to take?

Mr. TAYLOR. If we can save any money or extend our territory, we would certainly take advantage of the opportunity. At the same time, I am firmly convinced by the decisions the commission has made, and by the decisions made in other sections, and evidently the purpose of Congress in passing the Panama act and that part of it that gave the commission authority to say to a boat line, "You are the same as this railroad that runs parallel to you," and to say to the boat line, "You should consider this railroad in establishing through rates," and if that were done the actual lower cost of transportation by water would give us lower rates.

Col. NEWCOMER. By the way, do you have the boat rates in that schedule?

Mr. TAYLOR. Yes, sir.

Col. NEWCOMER. To Memphis?

Mr. TAYLOR. From all points to Memphis.

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Mr. AUTEN. Gentlemen, I believe this concludes what the city of Pine Bluff desires to present to you this morning. We have with us the Hon. H. M. Jacoway, Congressman from the Dardanelle district, which is up the river just a little way, as you know, and he will present the matter for that district. Mr. Jacoway.

Hon. H. M. JACOWAY. Mr. Chairman and gentlemen of the committee, I don't know that I can add much to what has been said here by those who have preceded me, as a general proposition, relative to making the Arkansas River navigable, as outlined in various reports, as I understand. My presence to-day is to present as best I can the proposition as it affects navigation between Little Rock and Ozark, which lies in my congressional district, that of the fifth district.

Having been in the halls of the National Legislature for two terms or more, I have found it the invariable rule of the Committee on Rivers and Harbors and the like committee in the Senate when a project of this kind is proposed for serious consideration by the committee that the interrogatory that is presented ever and anon and on every occasion is, "What is the tonnage that you now have and what is the proposed tonnage that river navigation would develop?" I do not claim, gentlemen, to be a civil engineer—know nothing of it—but in that regard I want to say that the people who are interested in this project are relying in a great measure, if I might not say absolutely, upon the report made by your body in 1900, I believe, which report shows that it is feasible and practicable for the Arkansas River to be navigated from Little Rock to Ozark at least. So I stand upon that proposition to-day, because it has been worked out and thrashed out by civil engineers of note.

The next proposition that then submits itself to me for discussion is this: "What is the tonnage that the Arkansas River would develop between here and Ozark?" And that is answered, gentlemen of this committee, in figures, as I view it, and in terms most eloquent. I want to say, as suggested by Senator Clarke here, that I don't know who it was that made the report suggesting or intimating that the Arkansas River project should be abandoned. For one, I want to say to this committee that we would have invited and we would have welcomed that gentleman into our community and to any county in this district and shown him every courtesy, and have gone into details, and I believe that when we have presented the tonnage that we now have—the inchoate of prospective tonnage—that the opening up or prospective development of this river would show that he would unalterably have been driven to the conclusion that it is feasible and practicable to develop and navigate the Arkansas River at least between its mouth and Ozark nine months of the year, because the report as coming from your body lays down the proposition, not in terms dubious or uncertain but absolute, that in nine months of the year a channel can be maintained between here and Ozark of an average depth of 8½ feet, and that can be done by a system of dredging, and I will add, parenthetically, that through the efforts of Senator Clarke and others in Congress two magnificent dredge boats lie here at the wharf, and, as I understand from river engineers—Capt. Evans, who is in this audience to-day, and who has navigated the river ever since 1852—that there are but 17 shoals between here and Ozark, which, if sucked out by these dredge boats, would give river navigation nine months in the year.

Now, in a little statement that I made sometime since, or an effort that I made in Congress trying to present this matter to the committee, relative to the tonnage which this river would produce—I want to invite the attention of the committee to those facts, which, I say, speak most eloquently—at least, from my viewpoint if not from yours—showing this condition of affairs as late back as 1906. In the biennial report of the Bureau of Mines, manufacture and agriculture for the State of Arkansas for 1905–6, the coal production of the State for that period is given as 1,875,569 tons, and that data was so accurately gathered that I can give you the distribution of it, and the distribution of that yearly output is as follows: In the county of Sebastian, 1,096,159 tons; in Franklin County, 339,449 tons; in Johnson County, 229,477 tons; in Polk County, 38,875 tons; in Logan County, 20,950 tons; in Scott County, 50,659 tons; stripped pits and smaller mines, 100,000 tons.

I will also say for the benefit of the committee that a gentleman who has been engaged in the coal-mining industry in this State for a number of years, Mr. Hoye, who has operated these mines and knew of their output, will not only verify these figures but these figures will be greatly augmented as the result

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of opening new mines since this biennial report of the secretary of agriculture was printed.

I will further invite the attention of the committee to a statement issued by the Little Rock Board of Trade showing the most important tonnage originating in this territory, which I will later append to my remarks.

Now, gentlemen of the committee, answering the interrogatory that the committees in Congress propound to you when you go before them asking for an appropriation at the hands of the Federal Government, that question which wants to be answered to the satisfaction of one great arm of this Government, the Engineering Department—what your tonnage is—I want to say that, lying along the stretches of the Arkansas River from this place where we now sit to Ozark, there is a proven coal field not estimated in any of this tonnage that I have given you, in which, if we had river transportation, there could be developed in a short time the magnificent sum of 200,000,000 tons of coal that could float down this Arkansas River to the markets of the world—most of it lying between here and the city of Ozark. I want to submit again that the freight rates to haul this tonnage to Little Rock and along the stretches of the Arkansas River are prohibitive. I think that I speak that which is exactly true if my information is correct—that the cost of hauling coal from Ozark down to Little Rock is $1.25 a ton. If we could have the benefit of what is termed "used rivers," according to this report that I now hold in my hand and invite your attention to, and which I will want to incorporate into my remarks—if we could have the benefit of used rivers, every ton of this coal could be laid down upon the wharves of this city, the capital city of this great State, at a cost of not exceeding 80 cents per ton; that, in so far as Little Rock is concerned, that would mean a saving to the city of Little Rock alone of the sum of $187,000, in round numbers, every calendar year. That means, gentlemen of this committee, that if the city of Little Rock could have the benefit of used rivers—and she is entitled to it in every sense of the word, as I view it—that if she had the benefit of used rivers most of her industrial and commercial problems that now harass her, on account of cheap fuel that other cities get along the river, would be entirely solved. Summing up the little argument that I attempted to make in the Halls of Congress, it would mean, gentlemen of this committee, a saving in freight rates in the State of Arkansas in one calendar year of $700,000.

I want to say that I am not an advocate of the "pork barrel" proposition, as suggested by the senior Senator from Arkansas, Senator Clarke. I believe that an intelligent, careful survey should be made of all of these projects that are presented to Congress, and those projects that are feasible and practical, eliminated from the "pork barrel" proposition, should be adopted by Congress and should be adopted by the Government and carried to successful termination; and I know of no project, according to facts and figures relative to the matter, that demands the attention of this Government more than the improvement of the Arkansas River, at least as far as Ozark, some 165 miles distant from where we are now.

An investigation of the committee of the lower branch of Congress will develop the fact that the great appropriations for the improvement of rivers are given to those districts which are represented upon the committee in the lower House. I know these gentlemen intimately and well. I am not on this occasion, and will not, impugn any motive they have, but I say to the board that if you will investigate the projects that have received the sanction of the Federal Government, even in the last bill as it went before Congress and was passed—and I don't think that I am mistaken—you will find that there is the solemn approval of the great arm of the Engineering Department of this Government laying its O. K. upon propositions that do not present the same possibilities and are not as dignified and as worthy of consideration, in my humble judgment, gentlemen, as is the improvement of the Arkansas River from its source up to Ozark. If you will examine this report, I think you will find that in one instance this great Government has made an appropriation to eliminate the wild hyacinths from certain streams in this country—more in proportion than they have appropriated money to improve this great stream.

I want to say, also, that I was born and raised up here in Yell County, some 75 miles distant. As a boy, I have seen 25 different boats bearing 25 different names docked at the wharves at Dardanelle, Ark., and making regular trips between Dardanelle, Ark., and the mouth of the Mississippi River, carrying thousands and multiplied thousands of tons of freight, and running regularly. On one occasion, as Capt. Evans here will testify, one boat

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went out of the little city of Dardanelle loaded with 5,000 bales of cotton. Freight rates in those days were much cheaper than they are now. One class of freight rates—I couldn't tell you under what class it comes, but will incorporate it into my remarks, if allowed to amend them—that freight that we got at Dardanelle in those days at 23 cents, when we had the benefit of used rivers or used streams, since river transportation has been abandoned, the people along the stretches of that country, and especially at Dardanelle, pay 69 cents now instead of 23 cents per hundred.

Now as to the freight rates. As to what it would mean for Arkansas, I am going to call the attention of the board to the great discrimination that has been made in favor of Memphis as against Little Rock, and I think it is a proposition that should challenge the attention and consideration of the committee.

On certain freight rates from Little Rock to New Orleans the cost is 55 cents a ton; on the same class of freight from Memphis to New Orleans it is 25 cents a ton. From Little Rock to Boston it is 80 cents a ton; from Memphis to Boston, 55 cents a ton.

Col. NEWCOMER. Those are hundreds instead of tons?

Mr. JACOWAY. I mean per hundred, yes, sir; thank you. From Little Rock to New York, 75 cents; Memphis to New York, 50 cents. I will incorporate the balance of this table in my remarks when amended, but I recite those to show the great discrimination that has been made in favor of Memphis.

I don't know that there is more that I can add on this occasion except to say that emptying into the Arkansas River between here and Dardanelle is a little stream called the Petit Jean. In some instances it has been made light of, and it has been suggested that it would be ridiculous to make an appropriation for that stream out of the Federal Treasury, but I have had the facts and figures compiled as to the tonnage that would come down the little Petit Jean and float into the Arkansas if it could have a few snags drawn out of it, and those figures show that, emptying into the Arkansas River and coming to Little Rock and other points, there could be annually a total of about 75,000 tons additional acquired from that little stream alone.

Now, in conclusion, gentlemen, I want to again call your attention—it isn't necessary, because you are more familiar with it than I am, or anybody else—to the report made by the Federal Government upon the feasibility of the navigability of this stream. In so far as the interrogatory is concerned, which I think has been answered here by those figures, we have the tonnage, and if we can ever get the Arkansas River used again I think the tonnage will be more than has been suggested here by me to-day. I also want to say again that I think the report that is made looking toward the abandonment of this stream—and I say it with all respect—is unjust, it is unwarranted, and is not based upon the true facts. I say it with respect, and I believe that an investigation of the tonnage that we can produce here will show those facts beyond the peradventure of a doubt. So, relying upon the proposition and arguing from the premise laid down by the Federal Government, that this stream is navigable, and arguing that proposition in the light of the tonnage that has been suggested here by me and others, I believe that when the engineers of this Government have had the facts fairly and squarely placed before them they will be unalterably driven to the conclusion that this stream should have a dignified appropriation, year in and year out, and 3,000,000 people should have the benefit of this great stream and watercourse; and if the Federal Government will do that, in my judgment, it will be developed into one of the greatest and most dignified streams that ever bore the white sails of commerce to the seas.

Col. BLACK. How do you account to yourself for this decline in river navigation? The river is in practically as good condition now as it ever has been.

Mr. JACOWAY. I don't suppose it will be wrong for me to state this, but in talking to a gentleman who has been a captain upon the Arkansas River for a number of years, he said that it was the policy of the railroads to put competing lines upon the river here in the early days for the express and direct purpose of breaking down river navigation. I suppose your question could be answered in one way from that standpoint. I think this report further answers the question when it states that, when the commercial interests lying along this great stream would get the benefit of the low rate, the railroads would then institute a lower rate, and the merchants and those interested in freight transportation would patronize the railroad until the water competition was broken down and the rate was lost.

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Col. BLACK. Under present rulings that can't be done.

Mr. JACOWAY. I understand it can't be done now.

Col. BLACK. No. Then, if that be the case and the river navigation is so much cheaper and has been so much cheaper, would it not be the natural thing that more boat lines would be established on the river now than ever before, because the river is as good as it ever has been?

Mr. JACOWAY. I would answer that question in the affirmative; yes, sir.

Col. BLACK. Another thing; do you know that the type of this dredge that is on the Arkansas River, and as good a dredge as there is in the United States, can only maintain about a mile and a half of channel a month?

Mr. JACOWAY. Yes, sir; I think your report shows about 2 miles a month.

Col. BLACK. That was before the experiment had actually been tried.

Mr. JACOWAY. Yes, sir.

Col. BLACK. That is based not only on the experience here in Arkansas, but also on the experience on the Mississippi and on the Ohio, the Ohio not being so conclusive. So you can see that in order to maintain a channel for the whole length by dredges alone—because those channels can only be maintained during one——

Mr. JACOWAY. I figured on it a little bit in Washington. I may be mistaken in the conclusions I reached, but from old steamboat pilots I understand that there are 17 bars between here and Ozark, and they are small bars, in most instances, which, if sucked out, would give river transportation between here and Ozark.

Col. BLACK. For nine months.

Mr. JACOWAY. For nine months in the year, and maintain a channel of 3½ feet, and my estimate is that in 16 or 18 months, with the capacity of those dredge boats, that these little bars could be sucked out and this channel be maintained.

Col. BIDDLE. You don't think they would fill up again?

Mr. JACOWAY. As I state, I am not an engineer, but from those who are engineers, if we had the benefit of used rivers—stern-wheel boats or any type of boats that would keep the river washed—that would help to do it.

Col. BLACK. Maj. Dent has given me the facts showing that one dredge on the river dredged 1½ miles a month. You must understand that they count the dredge——

Mr. JACOWAY. My estimate, I think, was working nine months of the year.

Col. BLACK. They can't work that long. You understand on these streams the movement of the bottom is so great that dredging is impossible or fruitless except at certain stages.

Mr. JACOWAY. Arguing from that standpoint, if two dredge boats couldn't do the work, it occurs to me that the Federal Government should give us four or six dredge boats to do the work, under the facts and figures which I think the tonnage on this river would show.

Mr. AUTEN. In order that the board may understand something of the order in which we are proceeding, I will say that this river is divided into six districts, the first river district being the Pine Bluff district, then the Little Rock district, then the Dardanelle, then the Fort Smith, then the Muskogee, and then the Tulsa district. I make this statement so that you will understand why we are calling these gentlemen in this order. I will now ask the gentleman, commencing at the upper end of the river, the Tulsa district, to come forward, Mr. C. L. Holland, of Tulsa, Okla., who will present the matter for that district.

Mr. C. L. HOLLAND. I represent the Chamber of Commerce of Tulsa, and I want to say to the gentlemen that I have prepared a statement which I desire to read to you, if you will permit me, and then will file it, and it will not be necessary to copy it. (Reads Exhibit F.)

My colleague will now give you his figures as to tonnage.

Col. BIDDLE. How far above Fort Gibson is Tulsa?

Mr. HOLLAND. It's about 60 miles.

Col. NEWCOMER. How far above Muskogee?

Mr. HOLLAND. About 50 or 55 miles.

Mr. AUTEN. The other gentleman from Tulsa is Mr. E. N. Adams.

Mr. E. N. ADAMS. I am traveling manager of the Tulsa Traffic Association, representing the chamber of commerce. (Reads Exhibit G.)

Col. BLACK. What railroads have you through Tulsa?

Mr. ADAMS. We have the Frisco, the Missouri, Kansas & Texas, the Santa Fe, and the Midland Valley. In handling crude oil out of the Cushing field, early last summer they were running five trains a day on the Missouri, Kansas & Texas, and I believe they ran about 60 cars to the train of crude oil alone.

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Col. NEWCOMER. I presume you are aware that Tulsa is above what is ordinarily considered the head of steamboat navigation on the Arkansas River?

Mr. ADAMS. Not according to statistics, I shouldn't think.

Col. NEWCOMER. Why?

Mr. ADAMS. I believe Mr. Holland said the encyclopedia says the Arkansas River is a navigable stream to 650 miles above its mouth.

Col. NEWCOMER. I hardly think that the encyclopedia is as good an authority as the report of the Chief Engineer. There has been no steamboat navigation up there, has there?

Mr. ADAMS. Not that I am aware of, not in the present day.

Mr. HOLLAND. I would like to answer that question, if I may. Prior to 1870 there was quite considerable navigation carried on on the Arkansas River as far up as Wichita, Kans. That is the history of it.

Col. NEWCOMER. I understand the history of it is, so far as we have been able to get it here, that two boats made trips up there.

Mr. HOLLAND. Yes, sir.

Col. NEWCOMER. One of them went up, I think, to get a bonus of a certain amount of money to go up there, but it couldn't carry out the load; so it couldn't get the bonus. The other went up one season and went out the other season.

Mr. HOLLAND. We think it's feasible to make it navigable by locks and dams.

Col. NEWCOMER. Oh, yes; I'm not talking about what can be done.

Mr. ADAMS. We believe we can turn out the tonnage if we had the river to use.

Col. NEWCOMER. Yes, sir. I just wanted——

Mr. AUTEN. I find the time is moving rapidly, and the board is compelled to leave us this afternoon at 5 o'clock, and we have so many matters to take up that I am compelled to ask those who have statements prepared not to read those statements in full, but just to make comments on them and file them with the board for their consideration. Is that all right with the board?

Col. BLACK. We will consider the written statements afterwards.

Col. NEWCOMER. It seems to me that the statements should be read if they are not too long.

Col. BLACK. We want to afford the opportunity.

Mr. AUTEN. I will call on Mr. E. D. Bevitt, of Muskogee, who will present the matter for the Muskogee district.

Col. BIDDLE. How far is Muskogee above Fort Gibson?

Mr. E. D. BEVITT. About 4 miles above Fort Gibson, across the river.

Col. BIDDLE. On the south side?

Mr. BEVITT. Yes, sir. I desire to file Exhibits H, I, J, and K. I will just state briefly the points to which we wish to direct special attention, and that is that Muskogee is interested in Arkansas River navigation not only to secure rates that are lower in and of themselves, but also to procure rates that are fair relatively with rates in surrounding territory. I will elaborate on that a little further. And also we want to bring out that if the project of navigating the Arkansas is abandoned at this time it will retard the development of that section of the country; but, over and above all, if Arkansas River navigation is abandoned and Missouri River navigation goes through, or is continued, that policy will be absolutely ruinous to our section of the country, as I will bring out further; that the Arkansas bears to the north and at Muskogee it is close enough to the Missouri at Kansas City so that the two projects at that point become interrelated, and that Kansas City, having the benefit of the river rate and Muskogee not, or that section of the country not, our rates will have a tendency to rise with the killing of this navigation project; that that will simply be ruinous to our jobbers.

I will briefly tell why the rates to Oklahoma at the present time do not bear a fair relation to the rates in surrounding territory. Our section of the State was originally Indian Territory, and, therefore, not settled. The States to the north and south—Kansas and Texas—were settled at a time when Indian Territory was still a wilderness, as far as the white man was concerned. The railroads originally entered Indian Territory from the north and were gradually extended toward the south. As that was done the railroads added to the Kansas rates a certain amount for each extension. The added factors were so high when the railroads reached Texas that the rates in southern Oklahoma, or the then Indian Territory, were in excess of the rates to Texas. For instance, the rate to a point in southern Indian Territory from St. Louis was higher than the rate from St. Louis to a point in Texas just across the Red River, and they maintained those rates for 15 or 16 years, but in 1901 they adopted the Texas rate as the maximum, as they called it. In other words, the rates to points in

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the State of Oklahoma would not exceed the rate to a point in north Texas, but the rates increased until the north Texas rate was reached. That was the history of the rates in Oklahoma until Muskogee began to develop as a city. At that time the roads all ran north and south. Along about 1905 the Rock Island was built east and west through Oklahoma, the Fort Smith & Western was built east and west, the Midland Valley was built from Fort Smith right through Muskogee. That enabled Fort Smith to cut in and to job in Muskogee's trade territory, and after taking the matter up with the carriers, and being unable to get any results, the merchants of Muskogee turned to the Arkansas River, on which they found reports of engineers saying it was navigable, although at that time navigation had entirely died out. You can see it was perfectly natural that they took the reports of the engineers for the fact that the stream was navigable and used that as a means of relief. They built a small boat, or procured a small boat, of about 50 tons, called the *Mary D*, in 1905. That boat made trips between Fort Smith and Muskogee, and the service was satisfactory. Then, to improve that service, they purchased a larger boat, a boat of about 300 tons, called the *City of Muskogee*, of which I have a photograph here. The boat was built at Evansville, Ind., and brought up to Muskogee loaded with three carloads of nails. This brought the railroads to terms, then, and they came to the Muskogee merchants and made reductions averaging about 19 cents per 100 pounds on most commodities. That placed Muskogee on a basis of approximately 7 cents above Fort Smith. That was a big reduction, and while it wasn't all they asked—they thought that the proper relationship would have been about 5 cents—but it was such a big reduction and such a big help, and the boat being owned by the city, or by the merchants and not a navigation company, and the merchants not caring to undertake the business or to give the matter the time and attention, the boat made no further trips.

Col. BIDDLE. How big a place is Muskogee?

Mr. BEVITT. Muskogee in 1910 had 28,000 people. We figure now—I think an estimate given out by the Census Bureau a short time ago gave them about 42,000 people. That is an estimate by the Census Bureau. I might add that a short time ago, owing to a case brought before the Interstate Commerce Commission by Oklahoma City, at which they complained that the rates to Muskogee unduly favored Muskogee as against Oklahoma City, the Interstate Commerce Commission found the discrimination to exist but left it to the carriers as to how to remove it. They gave the carriers the option of reducing the Oklahoma City rate or raising the rate to Muskogee. They adopted the latter course and raised the rate to Muskogee 6 cents per 100 pounds on iron and steel articles, and then raised the rate to Fort Smith 3 cents per 100 on iron and steel, thus reducing the differential from 10 to 7 cents. That is the present differential.

I have an exhibit here showing the effect of navigation on canned goods from New Orleans, effective June 1, 1908. The rate on canned goods from New Orleans to Muskogee was 51 cents. About that time the agitation in regard to the river navigation began, and on January 10, 1909, the rate was reduced to 40 cents, and a further reduction of 1 cent was made on February 1, 1910. Now, since river navigation has died out, the rate was increased from 39 cents to 44 cents, effective June —. The effective date is omitted from the exhibit, but it is of recent occurrence.

Col. ABBOT. That was by authority of the commission, I presume?

Mr. BEVITT. The rate was filed with the commission and permitted to stand.

Col. ABBOT. Under that other decision?

Mr. BEVITT. Yes, sir.

Col. NEWCOMER. Was that other decision that there was discrimination against Oklahoma City in favor of Muskogee on the same basis as the decision in the Shreveport case, that there was no substantial river competition?

Mr. BEVITT. No, sir. The commission held that though the river was navigable, a difference of 19 cents was too great, and they fixed it at 10 cents. The one allowed to stand was 10 cents.

Col. NEWCOMER. In other words, they recognized that you had water competition at Muskogee?

Mr. BEVITT. Well, the decision read that even though the Arkansas River were navigable, "we find 19 cents is too much." That was about the effect of it.

Now, we have statements here of the tonnage that, if the Arkansas River were navigable, you could route via the river. Taking the outbound tonnage, the first item is oil. There are two refineries at Muskogee, the Muskogee Refining Co. and the Cudahy Refining Co. The letter from the Muskogee Refining

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Co. showed that, based on their last year's business, they could export 3,952 tons of refined oil, which would move down the river to New Orleans for export. They also stated that, when the war is over, they could export a great deal more, because they could not now ship any to Germany, which is one of their largest customers. I won't read the letter, in order to be brief.

The Cudahy Refining Co. from Muskogee exported 1,862 tons, but at their own solicitation they ask permission to file a letter as to their Coffeyville plant. Coffeyville is north of Muskogee. It has been stated that the commission compels a through rate, rail-and-water, should the river be navigable, and on that basis they wanted to show that they could export from their Coffeyville plant, sending by rail to Muskogee and then down the river, 3,100 tons, based on their last year's shipments.

Then on cotton. The cotton compress at Muskogee compressed 106,000 bales. The letter from the compress company says that it is safe to say that they will never press less than 75,000 bales at Muskogee. Seventy-five thousand bales would give a tonnage of 15,000 tons, which would be exported. That is, 75,000 bales would be exported from Muskogee.

The Muskogee Cotton Oil Mill deals in cottonseed products, and their export tonnage, as stated in their letter here, will be 5,000 tons, giving a total of 20,000 tons for export of cotton and cottonseed products.

The Arkansas Valley at Muskogee is a great potato country. We have a letter from a commission merchant who deals in potatoes. We consider him an authority in that country on potatoes. He says that if the river had been navigable this year, he would have shipped on it 150 cars of potatoes, saying the minimum weight on potatoes is 30,000 pounds. This would give over 2,000 tons of potatoes which he could have moved down the river.

The letters show that in grain and grain products they could have used the river to the extent of 4,490 tons.

We have a concern there known as the Eagle Cider & Vinegar Co., that handles cider, vinegar, apples, and fruits, and they think they could have used the river to the extent of 180 tons.

Col. TAYLOR. Do you know what proportion of the total shipments they figure would go by water?

Mr. BEVITT. No, sir; I don't. In some cases that is stated. In some cases the wholesale people at Muskogee state 50 or 60 per cent of their inbound tonnage could come in by river.

Col. TAYLOR. That is practically all that comes in that way, isn't it?

Mr. BEVITT. The majority of their groceries would come from Mississippi or Ohio River points or Atlantic seaboard points.

Col. TAYLOR. It wouldn't leave anything for the railroads to carry, then?

Mr. BEVITT. Just like we have four railroads there. The total tonnage is so much. Of course, they don't get it——

Col. TAYLOR. Oh, no one railroad gets it all.

Mr. BEVITT. No, sir. The tonnage I have got here, with the exception of the outbound tonnage, is from points that could move via the river. It shows the hypothetical tonnage——

Col. TAYLOR. You are figuring just the same way—that all of it could move by one railroad, aren't you?

Mr. BEVITT. Yes, sir; just exactly.

Col. TAYLOR. But, as a matter of fact, it doesn't all move by any one railroad?

Mr. BEVITT. No, sir.

Col. ABBOT. This statement is made up by letters you have received from these people?

Mr. BEVITT. Yes, sir.

Col. ABBOT. How carefully were the estimates made?

Mr. BEVITT. In a good many cases I was present when they made their calculations. In some cases I aided them. I am in a position to state positively that the figures are conservative. We are supposed to be a boosting country, and I was surprised by the conservatism shown by the merchants. I intended to caution them to be careful, but it wasn't necessary. They were conservative in making their figures.

This gives a total outbound tonnage, based on business actually handled in Muskogee last year, of 35,700 tons.

On the inbound this is in a separate list, and I have it classified under groceries, packing-house products, dry goods, clothing, boots, shoes, hardware, etc. It makes a total of 58,725 tons.

Col. ABBOT. That's what would be available for river commerce?

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Mr. BEVITT. Yes, sir.

Col. ABBOT. But it wouldn't necessarily come that way; it would be divided between the river and the roads paralleling the river?

Mr. BEVITT. Yes, sir. But, in addition, the roads would have to themselves all the traffic that couldn't possibly come by the river, and, in addition to that, all this tonnage would move from river points where the rates would be affected by water competition; and, no doubt, if we have river navigation, the railroads would, to some extent, meet the rates the boats would maintain to those points, so it is fair to assume that there would be some reduction in rates on every pound of this merchandise. I will not take up your time to go into it further, but, as I say, it figures 58,000 tons and a little over.

I have some exhibits showing the resources of the country generally around through there—showing the increase of population of Muskogee. I will not take time to read these. You have stated that you will give the written statements consideration. It shows the grain and the coal and the products of the State generally which might move out via the river.

Now, as to the feature of discrimination and something we have hoped to obtain by getting the river improved: I have an exhibit (Exhibit H) which shows the class rates and some commodity rates from Memphis to Kansas City, to Joplin, to McAlester, to Vinita, and to Muskogee. Now, while Muskogee is much closer to Memphis than Kansas City, the first-class rate to Muskogee is $1.15 from Memphis, and to Kansas City and Joplin it is 80 cents in each case; and the carriers, in testifying in commerce cases before the Interstate Commerce Commission, where this discrimination is involved, invariably testify that the rate to Kansas City is depressed by the water competition, and that goes with the commission. These rates have been justified. We have never been able to break them down, and it is self-evident that if we had river navigation at Muskogee that we would have benefited to that extent. We certainly would have the same rate that Kansas City has. This exhibit also shows the class rates—I just named the first-class rate—to McAlester, which is 60 miles south of Muskogee, and to Vinita, which is about the same distance north. In both cases the rates from Memphis to those two points are less than they are to Muskogee. One is south of us and one is north of us, and neither on the river, and it is fair to assume that if we had the river navigation our class rates from Memphis would be reduced to the points north and south of us. And I might add that in all cases involving commodity rates the advance of the carriers of their commodity rate is invariably a comparison with the class rate, so that the class rate is the basis on which their other rates are made and which are justified nowadays, at least before the commission.

Now, the second page of the exhibit shows the class rates from New Orleans to Kansas City, St. Joseph, Joplin, and Muskogee. Muskogee is south of Joplin and west. Joplin is intermediate with Kansas City; therefore the rate to Joplin from New Orleans is the same as the Kansas City rate, $1.10, first class. The first-class rate to Muskogee is $1.35, although on some lines, like the Missouri Kansas & Texas, where their Kansas City business would pass through Muskogee, Kansas City is 200 miles north of us.

Col. BIDDLE. What is the reason for that?

Mr. BEVITT. The carriers would say it's river competition up the Mississippi River and up the Missouri, and Joplin is intermediate between New Orleans and Kansas City on the short line. The short line gets the benefit of this. Muskogee is on a workable line between the two points, but not being the short line they don't get the benefit.

Col. NEWCOMER. Isn't the real reason because Kansas City is such a large tonnage-producing territory and they want to make rates to get that tonnage?

Mr. BEVITT. They make it in competition with the river.

Col. NEWCOMER. But there has been no competition down the Missouri River.

Mr. BEVITT. It has been this potential competition.

Col. NEWCOMER. Don't you think it is the tonnage?

Mr. BEVITT. Kansas City, being a much larger town than these other towns, is in a position to have navigation. As a matter of fact, as you doubtless know, they have a corporation there in which the stockholders are merchants, with a paid-in capital of over $1,000,000—that is absolutely out of the question with us—and it is to hold down the power they have to produce navigation that those rates are put in.

Col. TAYLOR. Weren't those rates in effect long before that corporation came into existence?

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Mr. BEVITT. The possibility of the corporation being formed was there. Personally, I think we are on the verge of an era of using the rivers. I think that railroading was so much faster than rivers in the early days that it became a sort of a fad to use the railroads and the rivers were neglected; but I, myself, think that the minds of merchants and jobbers generally are turning to water navigation.

Col. BIDDLE. How much water would you have to have at Muskogee?

Mr. BEVITT. Well, we relied upon the reports of the engineers of 2 feet 2 inches. We were up against it on the rate proposition and tried to find some way out. We found this report of the engineers saying that for certain periods of the year a channel of 2 feet 2 inches was possible, and we grabbed that.

I think that about concludes what I wanted to say, except that I want to reiterate that the improvement of the Missouri River and the abandoning of the Arkansas River would be ruinous to Muskogee. Kansas City now, on account of their cheap inbound rates, has a great many traveling men making Muskogee on lines of goods on which there is a larger margin of profit. On shelf hardware they travel men in Muskogee. They ship a great many groceries into Muskogee on the Missouri water proposition, and if they had an increase—if the Missouri River were made navigable—the tendency of their rates there would be down, while if the Arkansas were abandoned the tendency of our rates would be up, and we would have no recourse and couldn't stand very much difference now without very materially hurting our jobbers.

Col. BLACK. Did you understand the recommendation was to abandon the Arkansas? The recommendation wasn't that. It was that the work on the Arkansas should be continued. That consisted of two kinds—of snagging, which proved to be effective, and the dredging, which, owing to the amount that was done, proved to be utterly ineffective. The proposition was to stop the dredging and continue the snagging.

Mr. BEVITT. Our understanding was if the recommendation was carried out, the improvement wouldn't be made up to Muskogee and our river wouldn't be made navigable.

Col. BLACK. The snagging operations were to be continued.

Col. TAYLOR. Practically all the work that was being done on the river would be continued.

Col. BLACK. The recommendation was that the work should be continued—that is, the work of snagging—but that the dredging be discontinued.

Mr. BEVITT. Our fear was that the carriers would say, "You haven't even potential navigation," and that to get our rates we must have potential navigation and a good prospect of actual.

Mr. AUTEN. Before inviting the next district that is to be heard, I will say that the board will continue this hearing until 1 o'clock. We will then take a recess until 2 and return here and resume the hearing at 2 o'clock promptly.

We have heard from four of the six districts. We will now listen to Mr. George Sengal, of the Fort Smith district.

Mr. GEORGE SENGEL. Mr. Chairman and gentlemen. (Reads Exhibit L.)

Mr. AUTEN. This brings the matter down to the Little Rock district, and I am going to ask the gentlemen who are here representing the Aluminum Co. of America to come before your board and discuss that business to some extent. Mr. John H. Finney, manager, from Washington, D. C.

I will thank you if you will ask any questions. That is the quickest and easiest way to get any information.

Mr. JOHN H. FINNEY. We had a great deal of pleasure in welcoming this board to Bauxite yesterday, and the gentlemen from Little Rock who accompanied us, some of whom were down there, I think, for the first time because, I think, that we have at Bauxite a very tangible river navigation proposition.

Bauxite moves from this point in Arkansas to East St. Louis for our own purpose and to various other points north and east of East St. Louis for other manufacturers. Our movement last year amounted to 140,000 tons for our own use. We moved this year, to yesterday afternoon, a total of 168,000 tons for our own use to East St. Louis, and to all other places for that same period, to November 15, 198,000 tons. We have moved from Bauxite for our own use and for other people 1,144,011 tons since 1903. It is a daily movement. It

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has been growing by leaps and bounds, and we are contemplating to-day a movement that will aggregate between 400,000 and 500,000 tons per annum.

The Aluminum Co. of America is the creator of the aluminum industry. When we first started our business under the Hall patents aluminum was selling at about $5 a pound. When the capstone of the Washington Monument was put in place—it is aluminum—it cost $15 a pound. To-day the prevailing price is somewhere around 20 cents. It has been done in your lifetime and mine—in the last 25 years.

The Hall process started in a small way in Pittsburgh in 1888; we moved to Niagara Falls in 1893 as the first user of Niagara Falls power. In 1896 we made 1,000,000 pounds. Last year we made 10,000,000 pounds.

It will probably be of interest to you to trace the movement of bauxite—our own movement of bauxite. Bauxite is the hydrated oxide of aluminum. It runs to 52 or 53 per cent alumina. We take the ore to East St. Louis, where we concentrate it by a wet process and get pure alumina or oxide. That is the only function of the East St. Louis works. That oxide is sent to various reduction plants—at Niagara Falls, three of them; to Messina, where we have a very large plant; to Maryville, Tenn.; reduction plants being also at those places because of the necessity for cheap electrical power in the electrolytic reduction of the alumina into aluminum. We are the largest users of water power in the world, with something over 300,000 horsepower at work in reducing alumina to aluminum. It is a very large and very important business, and the business is, as a matter of fact, really taxing the facilities of the railroads that come through this country to haul the ore to East St. Louis. A daily movement of from 30 to 35 carloads of ore, with two railroads to supply box cars—and it must be shipped in box cars—causes at various times a severe shortage of cars. We have frequently in the past years, even with a smaller movement of freight, found it absolutely impossible to get cars enough to haul the ore to East St. Louis, and that difficulty is bound to increase as time goes on. We realized that fact some two or three years ago and made ready for what we believed is the most tangible plan to use water navigation that exists to-day in the United States. We have spent a million and a half or two millions of dollars in East St. Louis in getting ready for this movement of freight by river. We have a magnificent outer belt that serves our belt from a terminal that is going to be second to none on the Mississippi River—a terminal located just opposite St. Louis with plenty of ground around it for transfer tracks, with interchange tracks, and arrangements with most of the railroads entering East St. Louis and a direct route to our own factory doors.

We have done more than get ready for it. We have actually engaged in the hauling of bauxite by water to East St. Louis, and we moved last year, as Mr. Fox will tell you, something like 15,000 tons from De Valls Bluff, down on White River.

It is a feasible proposition. We are not going into it with the idea of checking up a freight rate, although, of course, that is a contributing factor. As a matter of fact, the railroads originally charged us $1.80, then increased to $2.20. They now propose a rate of $2.40, and it may not stop there. We can certainly haul it to East St. Louis for less than $2.20, probably less than $1.80. But that isn't really the important point. The important point is to provide facilities that we must absolutely have and which only river navigation will supply. I think that is about all that we need to say. We have got the ore. We have got a yearly movement that is tremendous in extent and that we must get to East St. Louis every day in the year, and we have made our plans to put that stuff up to East St. Louis by river.

Col. BLACK. Are you still shipping through the White?

Mr. FINNEY. Not at the present time, because those were not our barges, and those barges have been withdrawn from that particular service. I might say, however, that we have four modern steel barges that will be delivered to us some time in December, and we will put our own barges into the service just as soon as they are delivered to us.

Col. BLACK. Over the White?

Mr. FINNEY. Over the White, and over the Arkansas when the Arkansas can be used.

Col. BLACK. On what draft of water do you find you can ship economically?

Mr. FINNEY. I think we have been shipping on the White in those barges on a draft of about 3½ or 4 feet. Our barges are 175 feet long, 1,000 tons capacity at 7 feet. They are not available for 1,000 tons at the lower drafts that we have in the lower Arkansas, but those barges are considered available when the

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Arkansas can give us 7 feet; we can load them to 1,000 tons, and when the condition of more water in the White exists we can load them to 1,000 tons.

Col. TAYLOR. Are those self-propelled marges?

Mr. FINNEY. No, sir; they are towing barges. Self-propelled barges, we feel, are a mistake on a stream like the Mississippi, unless we can put so much power in them that they are not really self-propelled barges but towboats.

Col. BLACK. You find on a draft of 3½ feet you can still ship by water on the White at a saving over the railroad?

Mr. FINNEY. Well, I think our experiment has proved it; yes. It wasn't an exhaustive experiment, because they were not ore barges; they were not well adapted to our use. They cost money to load and unload that we think we can cut in our own type of barges, which have been built for our own particular business. We believe that we can save over the $2.20 rate over either the White or the Arkansas.

Col. TAYLOR. Where would you ship over the Arkansas? What point would be your terminal?

Mr. FINNEY. Well, there are two points available—Little Rock, with good railroad facilities, and Pine Bluff, with almost as good railroad facilities.

Col. BLACK. What would be your railroad haul to Pine Bluff?

Mr. FINNEY. I am not sure of that. Mr. Fox——

Mr. C. B. FOX. About 45 miles to Pine Bluff.

Mr. FINNEY. About 45 miles to Pine Bluff, as against 16 to Little Rock.

Col. BLACK. What is your haul now?

Mr. FINNEY. Sixty-nine miles.

Col. NEWCOMER. What is your nearest point on the Mississippi—rail point?

Mr. CARL BAER. Helena.

Col. NEWCOMER. Is that nearer than Arkansas City?

Mr. BAER. It's a better route.

Col. TAYLOR. Haven't you under consideration the possibility of a rail line to the Mississippi River?

Mr. FINNEY. To be built by the company?

Col. TAYLOR. Well, over which your bauxite will be hauled.

Mr. FINNEY. I don't know that that's a possibility.

Col. TAYLOR. Hasn't it been under consideration?

Mr. FINNEY. Oh, a great many plans have been under consideration. We are under the absolute necessity of seeing that bauxite gets to East St. Louis through some channel at all times.

Col. TAYLOR. Cheaper than at the present rate?

Mr. FINNEY. If it can be brought about.

Col. TAYLOR. At least not at an advance?

Mr. FINNEY. Not an advance to $2.40. That $2.40 rate may not stay in effect many years. It will gradually increase.

Col. TAYLOR. You haul over your own road a little distance of 3 or 4 miles, and then turn over to the Iron Mountain, or one of the other roads, do you not?

Mr. FINNEY. Yes, sir.

Col. TAYLOR. Don't you get a portion of that $2.40 for the haul over your own road?

Mr. FINNEY. Yes, we get a division.

Col. TAYLOR. Quite a reasonable division?

Mr. FINNEY. Well, it's no more than the cost of doing the service.

Col. TAYLOR. What is it, may I ask, or don't you wish to give it?

Mr. FINNEY. Mr. Fox, what is that?

Mr. FOX. Twelve cents a ton.

Col. TAYLOR. That's what you get from the Iron Mountain, is it?

Mr. FINNEY. From the Iron Mountain, and I think 9 cents from the Rock Island. It isn't any more than the cost of doing the work.

Col. NEWCOMER. What is the rail haul to Helena?

Mr. BAER. I don't——

SOME ONE. From Bauxite to Helena, about 138 miles.

Col. TAYLOR. What was your rail rate to De Valls Bluff, or will Mr. Fox answer that?

Mr. FINNEY. Mr. Fox will answer that. I think the new rate that has gone in is 70 cents.

Col. NEWCOMER. Of course, you appreciate that on the Mississippi River there is now a channel available which would enable you to load your barges to 1,000 tons?

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Mr. FINNEY. Yes, sir; the Mississippi River is all right.

Col. NEWCOMER. You couldn't load your barges to 1,000 tons on the White or Arkansas for a time to come?

Mr. FINNEY. For a number of months in the year, but not——

Col. FLAGLER. Have you explored the whole bauxite field there so that you know about what the complete bed is?

Mr. FINNEY. No; I should say that complete ore body has not been explored. It is very questionable if anybody knows how much bauxite is here.

Col. FLAGLER. Have you made estimates on it?

Mr. FINNEY. We have of our own holdings. We think we know how much we have.

Col. FAGLER. Could you give an estimate in years, at your increasing rate of output, how long it would be before your would exhaust what you have there?

Mr. FINNEY. Well, that's just a problem in arithmetic. We have got nearly 5,000,000 tons, I should say, of available bauxite on our own property, and if we increase to 500,000 or 400,000 tons per annum we haven't got a great many years of ore on our own holdings; but this is the natural bauxite field. The geology of the region indicates that there is a great deal of bauxite in this particular section, and there is no question but that a great deal of it will be available—a very large tonnage will be available when there is sufficient demand for it.

Col. NEWCOMER. I would like to ask you a question about these terminal arrangements that you refer to at East St. Louis.

Mr. FINNEY. Yes.

Col. NEWCOMER. You mean a river terminal for the handling of bauxite?

Mr. FINNEY. I mean a modern river terminal, such as I don't know exists on the Mississippi River anywhere.

Col. NEWCOMER. To what extent has that work progressed?

Mr. FINNEY. Well, it hasn't progressed very far except that we have got the site, we have got the railroad to it, and we have got temporary loading and unloading facilities there.

Col. NEWCOMER. But it is your purpose——

Mr. FINNEY. It is our purpose to build a modern terminal that will handle not only the bauxite in but miscellaneous freight out.

Col. NEWCOMER. That is for general use?

Mr. FINNEY. That is for general use.

Col. NEWCOMER. In connection with what?

Mr. FINNEY. In connection with this Alton & Southern transportation line, or connecting line, that we have built in East St. Louis. It is a common carrier and is available for anybody's use, just as any other terminal facility—any other transportation company.

Col. ABBOT. It isn't exclusively for bauxite?

Mr. FINNEY. Not at all. Bauxite is going to give us quite a large and important tonnage, but it is only half of what we hope will be handled over that—only a small part of what we hope will be handled over it. Of course, our plans contemplate return cargoes for these barges—freight that is suitable to be handled in that way, and which will materially decrease the cost of handling the bauxite to East St. Louis.

Col. NEWCOMER. What is the title of that transportation company?

Mr. FINNEY. The barges, of course, are owned by the Aluminum Co. of America.

Col. NEWCOMER. You referred to some other——

Mr. FINNEY. Alton & Southern. It's a connecting railroad and terminal railroad there in East St. Louis.

Col. NEWCOMER. This navigation proposition wouldn't be operated by that company?

Mr. FINNEY. Well, not necessarily. I don't know that we have gotten to the point of organizing a transportation company per se. We are operating as the Aluminum Co. of America. The barges have been built by us, or for us, and there will be some operating agency. Whether it will be done by the Aluminum Co. or by a separate transportation company hasn't yet been determined. Priarily, it is for our own work.

Col. TAYLOR. Four barges wouldn't go very far toward handling your output.

Mr. FINNEY. That is true; but it is a mighty good beginning—four of the best barges on the river.

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Col. TAYLOR. How long do you figure it will take to make a round trip with one of those barges?

Mr. FINNEY. Mr. Fox is more competent to answer that question than I am. He is in direct charge. I think about 14 days, however.

Col. TAYLOR. You spoke awhile ago about the difficulty of getting cars.

Mr. FINNEY. Yes.

Col. TAYLOR. Isn't that a traffic that is pretty profitable to the railroad—such a regular traffic as that—so easy to pick up, and so on? It would seem reasonable that they would make a special effort to give you cars.

Mr. FINNEY. Well, they do make a special effort to give us cars, but there are not a great deal of box cars in this particular section available at certain periods of the year. Large amounts of cotton take the cars down to the Gulf terminals and keep them there sometimes as storage warehouses for cotton. There have been several periods when we couldn't get cars, and those periods do occur generally every year, and they are going to occur with increasing frequency as we want more cars.

Col. TAYLOR. Wouldn't it pay you to supply your own cars?

Mr. FINNEY. That has been thought of. Private-car lines are pretty expensive propositions.

Col. TAYLOR. That is true; but you could get up a special car.

Mr. FINNEY. But that's the trouble. You can't get up a special car that won't one day find itself out in California with something else in it. We can't ship in tank cars. A car that will load bauxite will load grain or almost anything else, you know.

Col. TAYLOR. Can't you control those if you own them yourself?

Mr. FINNEY. No, sir.

Col. TAYLOR. You couldn't control the movements of them?

Mr. FINNEY. You couldn't control the movements of them. They will steal them away from you.

Senator JOE T. ROBINSON. You would have to have return tonnage in order to make the transportation profitable in any car?

Mr. FINNEY. Yes; you couldn't run the car loaded there and empty back here and——

Col. ABBOT. Wouldn't you have coal to bring back? Wouldn't you have a market for coal if you——

Mr. FINNEY. We would be getting into lines of business we don't want to go in. We can do it in a mild way with barges. We can bring cement or something of that kind without loading ourselves up with a lot of miscellaneous businesses.

Col. TAYLOR. Didn't I understand the gentleman to say this morning that the rate on first-class stuff from St. Louis to Pine Bluff is $1?

Mr. BAER. Yes, sir; that's correct.

Mr. FINNEY. $1 per 100. I am talking about tons.

Col. TAYLOR. That's right; $20 a ton. So that you do get a low rate.

Mr. FINNEY. Oh, we have got a low rate. It's a cheap commodity and it moves in large quantities and it's a regular movement, and I imagine that the present rate is a profitable rate. They didn't lose money at $1.80, I don't think, but there is a general tendency to advance the rate to a point that is rather large to us when you consider the tremendous volume that is contemplated. A 10-cent advance amounts to a lot of money when you are moving 500,000 tons.

Col. FLAGLER. Is your power in your reducing plant at St. Louis dependent on coal?

Mr. FINNEY. Our reducing plant at St. Louis uses only a modest amount of power—just mechanical power for driving machinery. The form of our operations in St. Louis involves the use of steam in cooking—for digesters and things of that sort. We are not users of power in East St. Louis. We are larger users of coal and limestone and soda ash, and things of that sort that go to make up the items in the process, but at the reduction plants the element of power is the large one. We must have cheap electric power in large blocks in order to make cheap aluminum. It takes 20-horsepower hours to make a pound of aluminum, so that the electrolytic method is slow. It involves large amounts of power, and, necessarily, cheap power, to make the cheap product.

Col. FLAGLER. Why shouldn't your East St. Louis plant, where you reduce to alumina, be located at Bauxite?

Mr. FINNEY. That question is very frequently asked. If we could move Niagara Falls down here we could do the whole operation at Bauxite. We haven't cheap fuel; we haven't cheap limestone and soda ash. East St. Louis was

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selected as a cheap manufacturing and distributing point—a good deal better point than Little Rock—and the reduction works were necessarily located at these water-power sites. I think, when you figure the higher rate that alumina takes, the fact that we would ship half the amount that we are now shipping in the way of bauxite, it would seem that East St. Louis was a wise location for it. It would be nice if we had in this country what the French have, namely, bauxite, limestone, water power, and coal, all within a radius of 100 or 150 miles and fronting on deep water. A Frenchman said, in a statement to the Finance Committee of the Senate, that they could make, in France, aluminum 4 cents a pound cheaper than we can in the United States, and I don't doubt it; and I think it is largely because of their saving in the cost of getting the materials together from which the aluminum is made.

Col. NEWCOMER. You produce now about 50,000 tons per year?

Mr. FINNEY. About 50,000 tons per year.

Col. NEWCOMER. What is the world production, do you know—roughly?

Mr. FINNEY. Perhaps double that amount. All last year it has been very greatly disturbed by European conditions.

Col. NEWCOMER. You are the only producers in the Western Hemisphere?

Mr. FINNEY. Yes. Charles M. Hall, the inventor of the process here in the United States, invented the process/at the time that Heroult invented his process almost identically. They were working at the same time on practically the same thing. Heroult got his French patents and we got the American patents, and the industry there has grown just about as rapidly as it has here. I mean, the total foreign production is about equal to the total American production.

Col. BIDDLE. Will you permit me just one or two questions?

Mr. FINNEY. Yes, sir.

Col. BIDDLE. What does the East St. Louis plant represent in dollars?

Mr. FINNEY. Ask Mr. Fox that question, please. Several millions.

Col. BIDDLE. What, if any, investigation did your company make at the time of locating your plant there as to the cost of coal at Little Rock and how it compared with the cost of coal at East St. Louis, if you are advised on that question?

Mr. FINNEY. Well, I haven't been with the company but 15 years, so that was done before I came with them. I do know, however, that with the thoroughness with which we generally do things that matter was very thoroughly investigated at that time. It isn't only a question of the cost of coal. It involves every other factor that goes to the cost of making alumina. It involves the cost of getting the alumina to the reduction plant.

Col. BIDDLE. But on the single item of coal, I was asking.

Mr. FINNEY. Well, coal isn't really such a large part, because we don't use a great deal of power at East St. Louis—nothing like the amount we do in the reduction work. I suppose 10,000 horsepower——

Col. BIDDLE. For cooking or steaming purposes?

Mr. FINNEY. For power and steam purposes, perhaps 10,000 horsepower.

Col. BIDDLE. Has your company recently been considering the question, in view of rising freight rates, of procuring bauxite otherwise or elsewhere than in Arkansas?

Mr. FINNEY. Yes.

Col. BIDDLE. Would you mind telling the board what you have done in that regard?

Mr. FINNEY. Well, I don't want to say anything more than that. I do know that we have secured, or are about to secure, other deposits of bauxite not in the United States as a matter of guarantee that we will continue in the aluminum business. I look forward to the time when every hog bank is a supply for the aluminum industry. That time hasn't come yet.

Col. BIDDLE. Why did you look elsewhere? I am trying to get back to the point as to whether or not freight rates and other conditions here were responsible for that action.

Mr. FINNEY. Well, freight rates had something to do with it, because we have bought, or where we are contemplating buying bauxite we can undoubtedly deliver bauxite up to the coast—coast points—cheaper than we can deliver—as cheaply as we can deliver it to East St. Louis.

Col. BIDDLE. Could you take the ore from the fields which you have procured in France and South America and deliver it to East St. Louis as economically as you can the Arkansas bauxite?

Mr. FINNEY. No; I didn't say that. I said to the coast. It would, of course, involve an alumina plant on the coast.

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Col. BIDDLE. For reduction?

Mr. FINNEY. For reduction of that ore, of course, at the point of shipment. It might involve refining at the point of mining. It couldn't, of course, be brought into East St. Louis unless the Mississippi River were available some way.

Col. BIDDLE. Has your company, or have you, ever looked over the bauxite fields of Arkansas with the idea of making any approximate estimate as to how long the mines of Arkansas, or the bauxite deposits here, might last under the present rate of consumption?

Mr. FINNEY. I have not. There have been a good many guesses as to how much bauxite there is in Arkansas. Perhaps one man's guess is as good as another's. I have seen it estimated at 150,000,000. Hays's report estimated it at 50,000,000, and there are various other reports. I feel, myself, personally, that the man who says 150,000,000 is making as wild a guess as the man who says 50,000,000, because I don't believe either one of them knows, even approximately. Its a very faulty deposit.

Col. BIDDLE. Who made these estimates that you speak of?

Mr. FINNEY. The Geological Survey—they are available—and Hays's report, and others. I don't think any of them know with any certainty how much bauxite there is in Arkansas, but I would feel that the Arkansas district is the logical geologic district for the occurrence of bauxite.

Col. ABBOT. In the United States?

Mr. FINNEY. In the United States. There is some in Georgia, some in Alabama, and there is a little in Tennessee. There is a deposit of alunite out in Utah that has recently come into prominence as a source of potash supply. The Armours are refining it for the purpose of obtaining potash. Their by-product is alumina, so that this immense alunite deposit is an available source of supply. It isn't bauxite; it is alunite—a different thing.

Mr. AUTEN. What proportion of the American supply of bauxite comes from Arkansas?

Mr. FINNEY. Well, a very large proportion. The mines in Georgia and Alabama are not very large or important and are mostly used for the purpose of making alum. They are a little high in silica for our purpose. They are mainly used for alum supply.

Mr. AUTEN. Could you give us approximately, in percentage, what part is produced in Arkansas?

Mr. FINNEY. I should think considerably in excess of 90 per cent.

Mr. AUTEN. That's all, unless the board has some questions.

Mr. FINNEY. I will be very glad to answer any questions I can intelligently.

Mr. AUTEN. If that's all, we will ask Mr. Fox to come forward. Mr. Fox is the manager of the reduction plant in East St. Louis, Mo., which handles the bauxite mined here.

Mr. C. B. Fox. I have before me a large book containing figures showing the tonnage moving in the last 10 or 12 years, since we acquired those properties down at Bauxite. Mr. Finney has told you a good deal about the aluminum industry and the Aluminum Co., which I suppose you are interested in in a general way, and which, really, it seems to me, has hardly any bearing at all on this question of river navigation, which, as I understand it, is the subject that you have to consider.

I happen to be closely connected with this movement of river navigation for two reasons, one of them being that I have charge of the East St. Louis plant, which is, probably, the largest single plant the company has, and it is located fairly close to the mines and dependent very largely on the mines, so that the two have to cooperate very closely. Another reason, probably, is that I am still a young man and the company had no one else to throw all this work upon, so they put me at this job of river navigation.

When we first started to operate in Bauxite, we undoubtedly had the same idea that anyone else would have who was preparing to move low-grade freight—that is, if there was a navigable river anywhere accessible, we would consider the possibilities of utilizing that navigable river. There in't any place in the world, I believe, where they move ores or low-grade tonnage, but what they move it by water when it's possible to do so, and there never has been a time when it was more desirable to do so than now when the railroads have made a very good case, I believe, on the basis that it costs them more to operate than ever before, that it costs them more for material, that they pay more for labor, that their taxes are higher, and that there is every reason why their rates should be higher than they have been in the past.

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Now, if a low-grade commodity like ours has been moved in the past by the railroads at what they considered was not a very remunerative rate, naturally they would feel that under their increased expenses it would be still less remunerative, and that would divert our attention still more strongly to river transportation. In addition to that the tonnage has grown. When we started moving this material it wouldn't justify an investment in terminals, it wouldn't justify an investment in any considerable barge line or towboats to handle the material, but it has now grown to a tonnage on which such an investment is justified, and the course of freight rates has gone just exactly as one would have looked forward to when we first went into this proposition. When we shipped our first bauxite from these mines down here after we acquired them in about 1903—when we built the East St. Louis works—we shipped 9,827 tons; in 1904 we shipped 18,656 tons; in 1905 we shipped 26,836 tons; in 1906 we shipped 42,276 tons; in 1907 we shipped 52,584 tons; in 1908, following the panic, we didn't run more than half time—we started, I think, about May, 1908, after the panic of 1907—the tonnage fell to 28,997; in 1909 it went up again to 98,608 tons; in 1910 it was 107,176 tons; in 1911 is was 119,203 tons; in 1912 it was 108,984 tons. In the year 1912 we were partly clased down because of a car shortage the last three months of the year, when we couldn't get our full shipments. That's the reason why the 1912 tonnage fell below the tonnage of 1911. In 1913 we shipped 157,571 tons; in 1914 174,577 tons, and, up to yesterday, we had shipped 201,000 and some odd tons. The total shipments this year will probably run 225,000 tons.

Now, I say the tonnage has grown until we feel justified in investing in terminals, and if necessary, providing such river equipment as would handle this output. Another reason, and probably the more pressing reason, was that when we started to move this material from Bauxite the rate was $1.80 per ton. At that time we were shipping perhaps a car a day or two cars a day. When it grew to five or six cars the rate was raised from $1.80 a ton to $2.20 a ton, and two or three months ago the railroads filed an application with the Interstate Commerce Commission for an increase in this rate from $2.20 a ton to $2.40 a ton. A hearing was had on this increase in rate at Chicago about a month ago, and it wouldn't surprise me at all if the commission gave the increased rate of $2.40.

Now, we are differently situated in this country from the aluminum companies in foreign countries—the French and the British and the German aluminum companies. We take our bauxite and move it 450 miles or 440 miles to East St. Louis and pay freight on it. We take 2½ tons of bauxite to make 1 ton of concentrates, and we take 1 ton of concentrates and ship it 600 miles to Niagara Falls to make 1 ton of alumina——

Mr. FINNEY. One-half ton of alumina.

Mr. FOX. Yes; one-half ton of alumina—it's cut in two—and we ship it 1,200 miles to Messina to do the same thing, where we get our water power. In other words, we ship 5 pounds of ore away from this place down here at Bauxite in order to get 1 pound of the metal, and after we have made the metal at the place where we have hydroelectric power, we then have to ship it another 1,000 miles, where it is used, in the New England States, to the steel mills, and other places where it is used. In France and Great Britain and in Germany the bauxite mines are right close to the reduction plants, and the reduction plants are right close to water power, and the whole machinery for the production of the metal from the ore isn't only concentrated at one point, but it is close to tidewater, so they can land metal here on the east coast of the United States, as they did before the war, at prices lower than we can afford to sell it for to-day. When the war broke out, as Mr. Finney will corroborate—I don't know—there was some 6,000,000 or 8,000,000 or 10,000,000 pounds of aluminum in warehouses right down in New York and Philadelphia and Atlantic coast points——

Mr. FINNEY. That's true.

Mr. FOX. Placed there and on sale at lower prices than we could afford to sell it for. There's a reason for that.

Col. BLACK. What is the tariff on it?

Mr. FOX. The tariff, I think, now, is 2 cents a pound. Now, there's a very very plain reason for that. If you have to take 5 tons of raw material and carry it 450 miles to where you take the impurities out of it, and then take it another 600 miles to where you can get water power and separate the oxygen from the metal, and then take it another 1,000 miles to where you market it, your expense for transportation is so high that you can't compete with another

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concern which pays nothing for transportation, except on the finished metal, and their transportation on that is the lowest transportation in the world—water transportation. Under present prices for metal, such reasoning doesn't hold good, but we all hope and expect that this war isn't going to last forever. The argument I am making is based entirely on regular peace times, and in peace times, with the growth of this industry, the price of aluminum has come down from $16 a pound, which Mr. Finney spoke about, until before the war broke out he was selling aluminum for 17½ and 18 cents a pound.

Now, as we told these tax-commission people last summer—as the president of our company, here, told this tax commission here last summer—we would much rather do business on 17½ or 18 and 19 cent aluminum and sell 100,000,000 pounds of it than to sell 1,000,000 pounds for 50 cents a pound. We have got a natural pride, like every American has, in trying to build up an industry. We would like to have a big industry rather than a small one, and we would like to also have the slightly patriotic motive of getting this necessary and what is now comparatively common metal in the hands of everybody, in place of in the hands of a few people who can afford 50 or 60 cents a pound aluminum. When I was a clerk in a hardware store we used to sell a little 10-quart copper-plated kettle for $2.50, and when I came to the Aluminum Co. that same sized kettle was selling in aluminum for something between $4 and $5. You can buy the same kettle I have sold over the counter for $2.50 in copper in aluminum and it will last a lifetime. You take a young couple and present them with a set of aluminum cooking utensils and the cooking utensils will last longer than they will, if properly taken care of.

Col. BLACK. You mean if the cooking utensils are properly taken care of?

Mr. FOX. Yes. I will go back to what I started to say. The conditions that confronted us a year and a half ago impressed on us very forcibly that we couldn't afford to continue to pay high freight rates and freight on every move we make and compete with those foreign companies who have bauxite at tidewater and who have water power within a few miles of tidewater and who have cheaper labor than we have and who have got merchant marine and can transport their stuff anywhere in the world. Being confronted with that situation, the low price of the metal and the increasing freight rates on our bauxite, we became much more interested in this water transportation, and our president said to me, "Now, this question has advanced beyond the stage of a mere object of discussion. It has advanced to a stage where we have got to do something. We have seen our bauxite freight rate on our one car a day basis of $1.80 raised to $2.20 when it comes to 6 or 7 cars a day, and now raised to $2.20 when it comes to 10 cars a day. If we ship 20 cars a day we will be paying $3.50 a ton." So he said to me, "Now, I want you to go down and look into this river situation, and I am going to California, and if I come back from California and there has been no bauxite moved on the river to East St. Louis I will refuse to be neutral on the question any longer." So I got busy and came down here. I didn't know anything about river transportation. I looked over the Arkansas River. I looked over the White River. I went in to see Mr. Van Frank, in the United States engineers' office, and I asked him whether there was anything moving on any of these rivers. He said "The Government moves barges up the White River all the year around," or something like that; and I went over to the White River and I saw tows coming down there—these 500-ton barges with a big tug coming down and swinging around those bends. I looked to see if there was a place where we could unload anything. I found an old dock there that had been used by the Ayers-Lord Tie Co. to handle ties in and out. I went to Chicago and saw Mr. Lord and I leased that dock. I then went to the Atlas Transportation Co., who had some barges and who were moving cement down the river, and asked them if they would send some barges up the White River. I asked them to investigate the White River and see if they could send some barges up there and move some of this stuff. They said they would move it for $1.50 a ton. I looked at the Arkansas distance tariff and saw that the rate to Devall Bluff, the nearest point on the White River, should be 50 cents a ton. That made $2. I figured we could handle it at Devall Bluff probably for 10 or 12 cents a ton, and with the terminal we would build at East St. Louis I figured we could handle it there for 5 or 6 cents a ton, so we could equal the $2.20 rate, and we did move it.

We moved some 12,000 or 14,000 tons, and there wasn't anything about the whole proposition from beginning to end but what was perfectly feasible. I don't know of a single place where we fell down on the whole proposition,

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except the barges were wooden barges and had been used for handling logs or other things—the general type of wooden barge. The first barges we put in were regular coal barges, sunken barges. We loaded those barges and we found the water seeped in. They were old coal barges and the water seeped in, and the bauxite, which we had dried at Bauxite at considerable expense, when it arrived at East St. Louis was wetter than it was when it left the mines at Bauxite; and the first barge struck a heavy rain and absorbed some 25 or 30 per cent of water and came very near sinking. So that was a lesson to us not to use any more of those shell barges which sank down in the water. The next barges were decked barges, and the decked barges, while they moved the cargo dry, were really not very much better than the others, because the first barge we loaded they said "Be careful in loading it," and we loaded a carload right in the middle of it and the seams sprung on it and we had to put a gang of men to work there pumping the water out of it. Of course, spreading the stuff all around and closing the seams added very materially to the cost. In the unloading we had a steam crane that ran down and grabbed hold. There isn't anything cheaper unless you use big clamshells, but these clamshells would grab this ore spread out and they wouldn't get a real good bite before they would be down to the deck. If the ore had been piled in a ridge right down the center in a deep pile, the clamshells could have been worked and taken good, solid bites, and the cost of unloading would have been very much less. After unloading 4,000 or 5,000 tons—on one barge we loaded 758 tons, which was the largest barge we moved—after loading a few barges we decided that steel barges would be best, where you can run this stuff on it at your loading dock in two or three hours and can unload it easier in East St. Louis—the expense would probably be less. We tried to get some steel barges, but couldn't get them. We studied the question. The material had to be kept dry. If in a heavy rain it would absorb 25 or 30 per cent of water, you couldn't afford to load your barges up to full capacity or you would sink them. We finally decided on the tarpaulin scheme, and we ordered from the American Bridge Co. four steel barges so designed that the cargo can be put on them and a tarpaulin put on them and the load kept dry, and as they come into port the deck hands can remove the tarpaulins and everything be ready so that they can be unloaded with the clamshells.

We have gone into this river business to stay. We will either navigate the Arkansas or we will navigate the White, and we will navigate the Mississippi. Like this question of the amount of tonnage down here in Bauxite, I am convinced—I don't run the Aluminum Co., but I am convinced—that either I or my successors will move this tonnage on the river. With the increased expense of railroad transportation and the low price which will prevail after this war for aluminum, the only feasible way for the Aluminum Co. to stay in the business is to move this stuff by water, and when it's moved by water in the tonnages which we are moving now I am convinced that it can be moved from some river point down here for $1 a ton. There isn't any reason why these 1,000-ton barges can't be towed up that Mississippi River with one tug at all seasons of the year. There is plenty of water in the Mississippi at all seasons of the year from St. Louis to the mouth of the Arkansas. I am also convinced from the records I saw in the engineer's office here of the White River that the White River can be navigated 12 months in the year with practically 6 feet of water. I just want to make sure that I am right about that. [Refers to papers.] It was because of an examination of these records that we really decided to do something on the White River. In the White River at Clarendon, which is a few miles below De Valls Bluff, the Government record shows, in 1905, during the whole of the last 10 months of the year there was over 6 feet of water, and in January there was 6 feet—during 11 months, I should have said, in place of 10. In 1906 there was over 6 feet of water every day in the year. In 1907 there was over 6 feet of water every day in the year. In other words, there were only seven days in the eight years ending in 1912 when the gauge showed a reading below 6 feet.

Now, that was the basis on which we undertook to do something on the White River, and I am telling this because when we had a railroad hearing here somebody said, "Well, if we put in such-and-such rates what guaranty have we that the Aluminum Co. will move the stuff?" and I have heard it asked here a great many times this morning, "If navigation is put in effect you will put a boat on here, and the next thing the railroad will put the rate down and the boat will be taken off, and away will go the river business." I have endeavored to show that no matter what the railroad rates are, the rail-

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roads can't afford on this low-grade material to put the rate down to where the stuff will have to move by rail, and we are going to stay in the aluminum business and get our supply from the State of Arkansas.

After we had begun to move this stuff on the White River we had moved about 8,000 or 10,000 tons when a new railroad tariff was issued in the State of Arkansas raising the rate to De Valls Bluff from 50 cents a ton to 70 cents a ton, and that almost put a quietus on us, because if we had been in the business simply to get the railroads to put the rate down the 20 cents difference which that made would have been altogether sufficient to drive the river transportation company out of business. We were just about breaking even——

Col. NEWCOMER. I will ask you what was your share of that rate—your initial line's share?

Mr. FOX. On which rate?

Col. NEWCOMER. Of that rate to De Valls Bluff. I understood you got 40 cents out of that.

Mr. FOX. No; not out of the 70 cents. Under the State tariff here there is an arbitrary charge in case there is a two-line haul. The first line is given 40 cents a ton, and that's an arbitrary above the single-line haul. Whether they haul it 5 feet or 5 miles they get 40 cents. In other words, if there was a single line from our mines to De Valls Bluff the rate would be 70 cents, and if there was another line there and they hauled it only 5 feet or 5 miles they would get 40 cents in addition. As I am told, the State railroad commission here——

Col. NEWCOMER. I understand you to say the second line would get 40 cents in addition?

Mr. FOX. No; that first line that handles it.

Col. NEWCOMER. That's your line?

Mr. FOX. That's the Bauxite & Northern under the State tariff, but that don't come out of the tariff. When I spoke of 70 cents the trunk line was getting 70 cents.

Col. NEWCOMER. I thought that was both lines.

Mr. FOX. No, sir.

Col. ABBOT. So that 40 cents was simply an entry on your books?

Mr. FOX. Yes, sir. As I told the State railroad commission, if we do the switching we ought to get a revenue on the switching. If the Iron Mountain had built in there and had undertaken to take the cars in there and spot them and take them out, we wouldn't have built the Bauxite & Northern.

Col. BLACK. Somebody this morning said you got 10 cents out of the Iron Mountain out of the $2.20 rate.

Mr. FOX. Yes; and we perform the service for that. If the Iron Mountain would perform the service and pay for that line there we wouldn't do it.

Mr. BAER. What have you invested in that short line, approximately?

Mr. FOX. I think something like $150,000 or $160,000.

Mr. BAER. The 10 cents, then, covers the investment and the cost of carriage and operating the line?

Mr. FOX. The 10 cents is in payment for that service, taking the cars from the junction, taking them to the mines, spotting them, going in and getting the loads, and delivering them to the junction, and it's worth the money—just about what it's worth.

Col. NEWCOMER. I understand there's a distance tariff in effect in Arkansas.

Mr. FOX. Yes, sir.

Col. NEWCOMER. And that distance can be taken from Bauxite and not from the junction point to Devall Bluff.

Mr. FOX. Let me explain. As you cross that railroad you will see a place called Bauxite Station. Bauxite Station is a place on the Rock Island Railroad. What we call Bauxite is the mine. We take those cars out of there to the mines—just the same spotting charge that the Interstate Commerce Commission recognizes—a switching charge—terminal charge. We perform the service. The Bauxite & Northern goes in and places those empties at the mines, spots them at different places, takes the loads out and delivers them to the railroad at Bauxite Station. For that service it gets out of the through rate 8 cents a ton. The Iron Mountain, some few miles away, is a much longer haul, and for that same service for the Iron Mountain—you understand, we are performing that service for the Iron Mountain—it's the railroad's duty to go in there the same as they do at East St. Louis or any other place; it's their duty to go in and spot the cars and take them out. They don't do that here;

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the Bauxite & Northern does that. For that service for the Rock Island they get 8 cents; for a similar service for the Iron Mountain they get 12 cents.

Col. NEWCOMER. In the matter of the intrastate movement, your line is rated as a carrier?

Mr. FOX. Yes, sir.

Col. NEWCOMER. And the point of origin can be taken at the mines?

Mr. FOX. Yes, sir.

Col. NEWCOMER. And the distance tariff can be applied from the mine to Devall Bluff?

Mr. FOX. Yes, sir.

Col. NEWCOMER. And that distance tariff would be about 70 cents, wouldn't it?

Mr. FOX. No; if it was a single line it would be 70 cents, but because there are two lines the Bauxite & Northern handles it first, then the Rock Island, which is $1.10.

Col. NEWCOMER. You mean to say that the existence of a tariff that determines the rate ordinarily has added to it in the case of a double-line haul?

Mr. FOX. Yes, sir; the arbitrary of 40 cents is altogether too much, as we told the railroad commission here. For our service we are willing to put in a fair rate, 10 cents or 12 cents a ton to the Iron Mountain.

Col. TAYLOR. You get that 40 cents back, so it gives you a net rate of 70.

Mr. FOX. They might as well say $40, then the rate to Devall Bluff would have been $40.70. It has no relation to the——

Col. BIDDLE. It costs you about 10 cents to get it from the mine——

Mr. FOX. The switching service is worth about 10 cents.

Mr. BAER. The Aluminum Co., operating their own road, do not in any way participate in the 70-cent present rate——

Mr. FOX. No; you haven't got it right. The Aluminum Co. isn't operating its own road. The Bauxite & Northern is a railroad organized under the laws of the State of Arkansas. It has to ship for the American Bauxite Co. and the Aluminum Co. just the same as it does for every other man that offers freight. They have to do that.

Col. NEWCOMER. That railroad doesn't participate in the 70-cent rate?

Mr. FOX. It does not; no.

Col. NEWCOMER. What is the rate to Helena, do you know, from Bauxite?

Mr. FOX. Under the State tariff the rate to Helena, which is 140 miles. I should say would be about $1.10. They have certain arbitrary divisions where they divide 35 and 45 and 45 and 55. I did know what it was. They rearranged those divisions after we moved this stuff on White River so as to throw Devall Bluff right in the most expensive division. That was the first thing that occurred.

I have pretty nearly covered all the ground that I intended to cover, except this: We come now to the Arkansas River. People have said, "If you were operating on White River you are not going to leave White River and come up on the Arkansas, even if they do make it navigable." The Arkansas River, of course, is 40 miles closer to our mines—Little Rock is—than Devall Bluff, and if we had a third river that ran right to the mines naturally we would put it right on the boats there. The State railroad rate from Bauxite to Little Rock is now 40 cents, to Devall Bluff 70 cents. That's a difference of 30 cents a ton. And the distance to Little Rock from St. Louis is practically the same as the distance from Devall Bluff to St. Louis, so if there were water in the Arkansas and navigation on the Arkansas River, it would be to our interest; we wouldn't have to be put under bond to use the Arkansas; we would use it.

Col. BLACK. What would be the minimum depth you could use on the Arkansas?

Mr. FOX. Those barges are supposed to carry 1,000 tons on 7 feet. We would like to see 7 feet.

Col. BLACK. What would be the minimum depth?

Mr. FOX. That's a difficult question to answer.

Col. BLACK. That is the one we have to know.

Mr. FOX. It involves this: Which is it cheaper to do, to carry this stuff by rail to the White River, where you can get, perhaps, 7 or 8 feet 8 or 9 months in the year—this year, you could get more than that, probably—which is it cheaper to do, take it to the White River and operate your barges to full capacity seven or eight months in the year, or bring it to Little Rock with probably a maximum of 5 feet? I should think if you couldn't get 5 feet, there wouldn't be much use of bringing the barges up, not for our kind of stuff.

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Col. TAYLOR. You spoke awhile ago of being able to carry it for $1 a ton to St. Louis by water.

Mr. FOX. Yes.

Col. TAYLOR. Do you mean from your mine?

Mr. FOX. No; from the nearest navigable point.

Col. TAYLOR. How far is it from Devall Bluff to St. Louis by water?

Mr. FOX. It's 580 miles to the mouth of the Arkansas from St. Louis and 130-odd miles to Devall Bluff—about 725 miles.

Col. TAYLOR. A little over 700 miles.

Mr. FOX. A little over 700 miles; yes.

Col. TAYLOR. One dollar a ton would be about a mill and one-half per ton-mile.

Mr. FOX. Yes; I suppose so.

Col. TAYLOR. That's pretty cheap, isn't it?

Mr. FOX. Well, it's nothing like what they are carrying iron ore for on the Great Lakes.

Col. TAYLOR. But do you know of any place on any river where they carry it for a mill and a half?

Mr. FOX. The Detroit River. Of course that's part of the Great Lakes.

Col. TAYLOR. Where they are carrying it on 10,000-ton ships; of course, that's a rate which can't be equaled on any river in the world.

Mr. FOX. I don't know very much about any other rivers. I have told you just how I got into this transportation business; but, Mr. Engineer, I don't see, if there is water on the Mississippi, why you shouldn't carry it for practically the same rate. I saw lots of boats of 6,000 tons. I used to operate a dock on the Great Lakes. We had lots of boats carrying 3,000 tons.

Col. TAYLOR. They didn't carry it as cheaply as they do now.

Mr. FOX. They carried it from Duluth to lower lake ports for 60 or 65 cents a ton, and they are carrying it now for as low as 35 and 40.

Col. TAYLOR. There you have very unusual conditions. You have a long haul, remarkably cheap loading and unloading, and they are comparatively cheap boats carrying large loads and going all the time.

Mr. FOX. Why should the loading be any cheaper there than we can make it at Devall Bluff and East St. Louis—loading and unloading? I operated at Port Huron with the same kind of machinery that we have at East St. Louis. They can't load at upper lake ports any cheaper than we can here if we are on the river and chute it into a barge. There isn't a particle of difference. You have got the same kind of water in the Mississippi you have got up there, only it's dirtier.

Col. TAYLOR. It's running faster.

Mr. FOX. Yes; but you get the advantage of it.

Col. TAYLOR. But you are going up loaded.

Mr. FOX. Yes, sir; but you get more wind and wave up there than down here; and I have seen a great many of them held up for days by wind and wave.

Col. BLACK. And you think barges with towboats would compare, in cost of operation, with light steamers?

Mr. FOX. I think so. Say we pay $15,000 apiece for these barges—$60,000. You get a towboat capable of handling 6,000 tons up the river and you will probably pay $250,000 for it. That's just a rough guess of mine. Six barges—you would have, say, $350,000. Those boats they used to handle iron ore were laid up three months in the year, and they frequently would go up light at a greater expense, probably, than they would loaded.

Col. NEWCOMER. The estimate of yours of $1 a ton, as I understand it, is simply for the moving in barges from one terminal to the other; it doesn't include the terminal charges? In other words, it is comparatival to the present rate you have?

Mr. FOX. You can load that stuff, if you have got the right facilities—you ought to load it for a cent and a half a ton—material like ours. You ought to be able to put a bin up there and belt conveyer under it and run that belt out and discharge on the boat.

Col. NEWCOMER. That's without any overhead charges?

Mr. FOX. Yes, sir; that's without any overhead charges; but when you get into the game you have got to forget about your overhead. If we invest $1,500,000 or $2,000,000 in barges and terminals we have got to forget about the overhead; we have got to run that——

Col. NEWCOMER. That's a part of your cost?

Mr. FOX. That's a part of our cost; yes.

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Col. NEWCOMER. I wish to ask whether you have any propositions from towboat people which will justify an estimate of $1 a ton, or whether that is your own estimate.

Mr. FOX. We have an estimate of $1 a ton from East Memphis. Any time we want to move our stuff, we can get plenty of towboat men to move it from East Memphis or New Hopeville. I have examined the equipment that those men have got, and I think we can get equipment which will absorb the difference. That's my basis for thinking we can move it for $1 a ton. Is that a good reason?

Col. NEWCOMER. How far is it from St. Louis to Memphis?

Mr. FOX. Four hundred and fifty miles.

Col. NEWCOMER. How far from Memphis to the mouth of the White?

Mr. FOX. About 180 miles. But they will make the same rate practically to the mouth of the Arkansas that they will to Memphis.

Col. NEWCOMER. That's a very different proposition.

Mr. FOX. Yes; or to Helena. They don't care so much where it is, just so long as it's on the Mississippi. They dislike going off the Mississippi.

As I understand this question, this report has been made that further appropriations be discontinued on these rivers because of the fact that there was no tonnage; that the tonnage was decreasing; and that there was no prospective tonnage. All that we want to appear before this board and say is that we do have the tonnage. We have got a tonnage that is constantly increasing and that will continue to increase, and we will use the river if you will give us a river, and, as evidence of that, we have used the only stream that anybody can negotiate with these boats, and that is the White. We have bought these 4 barges and will buy probably 25 more, and we will possibly buy more; and, as I told Mr. Barrett of the towing company, "We would like to have your company do our towing, if you can do it. If not, we will do it ourselves."

I am probably more familiar with this bauxite tonnage than Mr. Finney is. There have been all kinds of estimates made—from 4,700,000 to 500,000,000. My opinion is there will be bauxite here for my children and my grandchildren. Ever since I have been with the bauxite company I have heard—and I probably joined in with them four or five years ago—"We had better look out for our bauxite and take care of it, because our production is going to exhaust it"; but every so often when the man in charge of the mines comes along and says they are about gone, some fellow comes along and is mining bauxite, and we go down there and buy that man's property, and we have probably 1,000,000 or 2,000,000 tons there. That has been the history of this field ever since we went into it. Last summer a man came into Pittsburgh—he's connected with this natural-gas pipe line—and came in to see us and said he would guarantee that he had 15,000,000 tons of bauxite on his property. I haven't any doubt he has it. He's one of these lucky fellows. Whenever he goes into oil or gas or anything he hits it. He will be probably selling us bauxite. That's one instance. I think here in the State of Arkansas there is plenty to keep us going 50 or 60 or 70 years.

Col. NEWCOMER. Without knowing where it is going to be discovered, can you say whether it's in reach of the Arkansas or White Rivers?

Mr. FOX. If you study these bauxite deposits in this country, you will reach the decision that this district is of such a geological nature that it will be found in this section. Nature has acted on syenite in this district so as to produce bauxite, and she hasn't acted on it in that way in others.

Col. NEWCOMER. I would like to get into the record a statement of the approximate extent of the bauxite field as at present known. The statement was made to me yesterday that it isn't very wide—if that's true—possibly a few hundred yards wide and a couple of miles in length.

Mr. FOX. My idea is that there are two or three counties in which there will probably be plenty of bauxite found for a good many generations.

Mr. AUTEN. About what is the cost of the terminals—I don't mean cost—about how much have you expended on the St. Louis river terminals and the railroad running to it, up to this time?

Mr. FOX. We have spent somewhere between $1,500,000 and $2,000,000.

Col. TAYLOR. That is your St. Louis reduction plant?

Mr. FOX. Oh, no; that's the belt line and terminal.

Col. TAYLOR. That's the St. Louis terminal?

Mr. FOX. East St. Louis terminal.

Col. ABBOTT. Alton & East St. Louis Railroad?

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Mr. Fox. Alton & Southern Railroad is the corporate name under which that $1,500,000 or $2,000,000 has been spent.

Col. Abbot. That is for the whole terminal development?

Mr. Fox. Yes. The Kansas City & Missouri River Navigation Co., that some one spoke of here—the Pine Bluff man spoke of getting these rates through to the East—are now negotiating with us for the use of our dock there so that they can bring their material in, and, with the railroad connections we can give them, transport their material through on these eastern lines.

Col. Taylor. They have a terminal of their own in East St. Louis, have they not?

Mr. Fox. They have a lease and it expires this year or next. The Terminal Association owns that river front for 21 miles, practically from Alton to where we bought, in East St. Louis. We couldn't get anything from the Merchants Bridge to where we are.

Mr. Auten. How far from the river is your reduction plant?

Mr. Fox. About 3 or 4 miles.

Mr. Auten. What is the expense of a reduction plant—the amount of the investment?

Mr. Fox. I suppose we have got somewhere between $5,000,000 and $6,000,000 invested.

Mr. Auten. Where does the railroad begin with reference to the reduction plant and where does it run—the terminal railroad?

Mr. Fox. The terminal railroad was built as a belt line from Alton around to East St. Louis. It has been built up to the Vandalia Railroad, and the Vandalia Railroad has been fighting the crossing there for the last two and one-half years, and that's the reason it hasn't been built——

Mr. Auten. Where is the southern terminus of the railroad?

Mr. Fox. The southern terminus of the railroad is practically at East Carondelet.

Mr. Auten. At your docks on the river?

Mr. Fox. At our docks on the river.

Mr. Auten. And the cost of $1,500,000 you have mentioned includes the cost of that and what you have expended on the docks on the river?

Mr. Fox. Yes, sir.

Col. Taylor. That $1,500,000 has been spent——

Mr. Fox. Every dollar of it by our company. We built the belt line, bought the river front property and paid something like $135,000 for the river front—good, solid cash. I paid for it.

Col. Taylor. Does the Aluminum Co. own the——

Mr. Fox. The Aluminum Co. owns all the stock of the Alton & Southern Railroad, just the same as it owns all the stock of the Bauxite & Northern.

Col. Taylor. They have got the water-front condition sort of tied up in St. Louis.

Mr. Fox. No. As I say, there's 20 miles owned by the Terminal Railroad Association, which is owned by the 23 railroads which come into east St. Louis, and they haven't got a dock.

Col. Taylor. Where does the public come in?

Mr. Fox. The public don't come in. The Terminal Railroad Association don't build any docks. They have got a levee built there so that you can't build a dock any more. We had to go below the levee district to get to a place where we could build a dock. You can't build a dock on a sloping levee, you know. The Terminal Railroad Association, owning that river front, is owned by railroads which parallel the Mississippi River.

Col. Taylor. Then they won't encourage the building of docks?

Mr. Fox. They won't encourage the building of docks, and I wouldn't, either, if I was president of a railroad paralleling the Mississippi River.

Col. Abbot. Why does the Alton & Southern come in there—for general benefit——

Mr. Fox. The Alton & Southern does it primarily for its own benefit—for the benefit of the Aluminum Co. interests—but it's like all those propositions: If we don't get any outside business, it's a pretty heavy investment for our own business. We expect to develop——

Col. Abbot. You expect to derive a revenue from the use of this terminal which you put in primarily for your own protection?

Mr. Fox. Yes, sir.

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Col. ABBOT. And you let other people in, not from general charity, but because you can get money out of it to help support your own expenses of your own terminal?

Mr. FOX. Yes, sir.

Col. ABBOT. What limitation and what guarantee has the general public got as to what you are going to charge them for your facilities there?

Mr. FOX. The charges are limited by the Interstate Commerce Commission and the State commission.

Col. ABBOT. So you have to keep it open on equal terms, which are under the control of those bodies?

Mr. FOX. Yes, sir; we have to.

Col. TAYLOR. You have that railroad for the purpose of building up a river business?

Mr. FOX. Primarily to get to the river.

Col. NEWCOMER. You use it in handling your present rail traffic, I suppose?

Mr. FOX. We do; yes, sir; and we are trying to get interchange traffic with other railroads. The other belt lines closer in town being built up the service is very much slower. No large interests have located on these belt lines in the last five or six years. We have locations for new industries.

Mr. AUTEN. Will you kindly state to the board what the intentions of your company are in regard to this railroad traffic—if you haul your bauxite to East St. Louis by barges, what your company intends to do about return traffic and whether or not the Arkansas River would be a much more profitable stream for you for return traffic, and why?

Mr. FOX. I wonder anybody asks that question. If we have got barges coming down the river and anybody has got any freight to offer we will take it. It will very much reduce the cost of operations. We are not going to bring the barges down light if anybody has any freight to offer. Naturally all related products, like coal and cement and other materials that are easily handled, would be the complementary cargoes to bring down.

Mr. AUTEN. If the railroad rate were $1 a ton, you could haul this freight in competition?

Mr. FOX. No question about it. You could bring your cargo over to our dock and put it on it and take the crane and drop it aboard and take it away. That's the great trouble now. A man has got to bring the stuff to East St. Louis and take it down to the levee and handle it.

Mr. AUTEN. At what cost can you get steaming coal delivered on your docks at East St. Louis?

Mr. FOX. At an average price the year around of probably 90 cents. Some months of the year we buy coal there for our boilers—screenings—put in our bunkers, for 45 cents. In the fall of the year, when there's a great demand for lump coal, I've seen it come into East St. Louis and have bought it for the freight, 32 cents.

Mr. AUTEN. Comparing those prices—what it can be delivered to East St. Louis for—and the Arkansas prices at which it can be handled——

Mr. FOX. I understand we pay something like $3 a ton for Arkansas coal at our bauxite mines.

Mr. AUTEN. At what cost could you deliver the East St. Louis or Illinois coal here if you were running barges on the river?

Mr. FOX. I wouldn't like this to go into the record, because when some fellow goes to put a price on it he might look up this record.

Mr. AUTEN. I was asking what the cost would be, and not what you would charge. Could it be delivered in Little Rock at a much lower cost than the Arkansas coal?

Mr. FOX. Undoubtedly. I should say you could deliver it here for $1.50 a ton, anyway.

Mr. AUTEN. We have with us Mr. F. B. T. Hollenberg, and will ask him to make a statement to the board.

Mr. F. B. T. HOLLENBERG. I haven't given this particular matter at this time much study, although several years ago I appeared before the board of engineers that was down here, and at that time I had assembled quite a number of facts and figures, but they have entirely gone from my mind. So it isn't for the purpose of giving you any particular data that I now speak to you, but more from the general aspect of the case.

The situation, as I view it, isn't one of objection to railroads. It is, on the other hand, a very great benefit to the railroad—the very fact that by the navigation of the Arkansas and the White we can handle the low-grade coal-

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modities in large quantities at a price at which they do not make any profits, thereby relieving the situation of car shortages and other objections that occur—the cost of moving these materials, of handling coal and bauxite, and all other low-grade commodities in great quantities, instead of loading up their expensive systems of doing business with the low receipts from this material. It really puts them in the position of having them properly cared for by the water navigation, thus giving to the railroad the opportunity and the chance of handling the higher-grade commodities upon which there is a profit to the railroads; and it is a well-known fact, I believe, that the channelizing of the waterways in Germany and in other countries hasn't decreased the revenues of the railroads, but, on the other hand, has enhanced them; and that is the view I take, that if we were coming down here to destroy one of the greatest factors that we have for progress and the building up of this country, namely, the railroads, I would say, "Heaven forbid"; but, on the other hand, if I say to you and if you believe that the making of these rivers useful is not a detriment to the railroads, but, on the other hand, is a benefit to them, I should say, "Gentlemen, it is certainly the part of the Government, and you, as agents of the Government—it is your duty to provide the ways and means to do it." The question of whether it's a few thousand dollars more or a few million dollars more isn't so much the point; the thing is, is it feasible, can it be done, will the results justify it, are the communities along it benefited by this great improvement, will it be of continuous and material benefit to the people? If so, it must be done; and while we beseech and implore you gentlemen to do it, we feel that we are entitled to put even a little stronger pressure to the words and say we hope you will go into it on that point.

It isn't for the purpose of complaining of the conduct of the railroads in the past, but I will say that this section has been unfairly treated. By the efforts of its representatives to manipulate legislation, one of our railroads has created a great deal of antagonism. I was speaking to Mr. Bush the other day. He was complaining about the actions of Arkansas in the matter of freight rates. I said, "Mr. Bush, I would like for you to admit or deny the statement I have heard frequently, namely, that the Iron Mountain has paid the losses of your Missouri-Pacific and Denver & Rio Grande when it was in trouble, and the Western Pacific. Is that true?" He said, "We don't make any more out of Arkansas than we are entitled to." I said, "Be specific. How much do you make out of Arkansas? If you don't want to answer the question, you can turn it aside." He said, "We don't make more than 4 per cent on our Arkansas roads." I said, "Do you make anything like that on your other roads? On what basis do you make your 4 per cent? Is it on the basis of the actual cost of your railroads or 10 times that in watered stock? Will you answer those questions? You are making 4 per cent; you have got an alternate section of land for all your miles of railroad on the Iron Mountain in Arkansas. Do you credit any of your present cost of your railroad with the receipts you have obtained from the sale of land? Have you decreased the bonds and stocks? The sum and substance is, you are paying 4 per cent on a one-tenth valuation and the people of Arkansas are paying you 40 per cent very much closer than they are paying you 4 per cent on the actual cost, and that's done on the business in Arkansas and through Arkansas by the Iron Mountain."

As I say, I want the railroads considered, because they are the greatest factors of development; but, at the same time, we are not looking after the railroads. The railroads will take care of themselves, as they have very frequently done heretofore; because, as soon as we would start a little navigation plant, by some peculiar movement of the machinery of rate making the project was immediately choked, as in the case of the movement of bauxite to Devall Bluff, mentioned here this morning. They have got lots of brains and money and time, and they work the thing out. But I am not criticizing them. But there is another feature. Mr. Sengel tells you there is only 15 per cent of our acreage under fence. We all know, and it is a fact, that the value of the produce raised annually per acre in Arkansas will approximate, year by year, throughout the entire State, 100 per cent of its value. That is not true of any other State in the Union. Take $150 and $200 an acre lands in Iowa and Illinois and they will not produce a gross return of over possibly 30 or 35 per cent. Why is it true that so little of our land is in cultivation? And what is the remedy? We should prevent the railroads from keeping us throttled up on the question of rates, as they have done, not to their benefit but to their discredit and their loss, because the greater Arkansas will grow the greater the railroads will grow, and, secondly, if you can give us, through water transportation, an in-

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creased commerce, the railroads will have a doubly and triply increased commerce and their profits will be much larger. So you are aiding the railroads. I can't understand—can't see the theory of the railroads which say that by throttling a growing community they are enriching themselves. It would be well if they would increase immigration. And that, gentlemen, is going to come sooner or later, and water navigation will be the greatest thing to bring that about, because if we can bring our commodities in here cheaply and take them out cheaply, industries, manufactures, increased population will come, and the value of our products will increase from $350,000,000 and $400,000,000 to $1,500,000,000 or $2,000,000,000 a year, because we have got all the natural resources, fertile soil, the climate, and everything; and it is the duty of the Government of the United States, when we have such great possibilities here, when the expenditure of a few million dollars—say $20,000,000 or even $30,000,000; some men said $30,000,000—$30,000,000 isn't a great sum when they can spend $100,000,000 on other things that are not so meritorious—why is Arkansas not entitled to its share of the money? We don't criticize the Government for doing something for somebody else. We have the advantages, we have everything at our doors, we are as great and glorious a community, we are as patriotic as any. Arkansas supplied the first regiment that was ready for service in 1898 in the Spanish-American War. We are with you. We are all one. All we want to do is to grow. We have got a natural waterway; we have got everything here; we just want the United States Government to see what we can do with their help.

Col. BLACK. It is now 1 o'clock. We will take a recess until 2 o'clock p. m.

AFTER THE NOON ADJOURNMENT.

Mr. AUTEN. Gentlemen of the board, I wish to present Capt. Joe Evans, of Dardanelle, an old steamboat man.

Capt. JOE EVANS. Gentlemen of the committee——

Col. BLACK. Tell us something about freight rates in the old days.

Capt. EVANS. I am 82 years old——

Col. BLACK. Nobody would think it.

Capt. EVANS. I have been steamboating since 1852. I commenced on the Cumberland River. I steamboated on the Cumberland, Ohio, Tennessee, Mississippi, and on the Arkansas. When I came to Arkansas Napoleon was a town almost as big at Little Rock—it's gone now—in July, 1860. I knew the condition of the river at that time thoroughly, and have since that time. I will briefly state I commanded the snag boat *Wichita* in 1882 for Capt. H——, who was in charge of the engineers' office, and was ordered to go to Arkansas City, Kans. I never went there, but I went farther up the river than anybody else ever did go. That was a pretty good-sized snag boat, about a 200-ton boat, a small boat for those days. I got to Coffeyville Landing, tied to an oak tree, and remained seven months. It was dry, so I could walk across both above the boat and below it. That was in the fall. In the spring or summer I got back by waiting for a heavy rise. We got a 6-inch rainfall in 30 hours and floated down. In coming down the river—I have a reason for stating this—the only way I could get down that river was to watch the drift logs that were drawing more than I was. There were a few drift logs up in that country. Most of it was prairie, but higher above there was a timbered region. So I would follow one until it lodged, and then I would go after another. I found that river very difficult; in fact, from the bridge at Muskogee up there were something over 900 islands and towheads. In other words, I found the water scattered all over that country, and after you got up beyond Tulsa the banks were not much higher than that table. The Indians would wade across, ford it with their ponies, and step out on the bank.

But, to get back to my river at Napoleon: When I got to the Arkansas River I found a line of boats running from Memphis to Little Rock, from St. Louis to Little Rock, from Cincinnati to Little Rock, and from New Orleans. I say "to Little Rock." I will change that. I will say to Fort Smith and Gibson. Nearly always we had freight to Fort Smith. When we got there we would go on to Gibson. That was a very important military post at that time. So I found the river in low water much deeper than it is now, a great many snags in it and very difficult to navigate, but we had water seldom ever less than 2½ or 3 feet. The Government commenced snagging the river then. The war came on. There wasn't much doing during the war. However, I was chief of transportation and was on the river all the time. I kept posted on it. At that

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time we had no railroad. There was no railroad in the State of Arkansas. There wasn't a mile of railroad in the State of Arkansas, except a little piece from here over to Devall Bluff, and then you would get out and go over toward Memphis and get a train and go into Memphis. I still continued steamboating. Directly after the war closed they built this Cairo & Fulton road, which is the Iron Mountain now; then they built this road from Little Rock to Fort Smith. That was built—completed about 1874 or 1875. Up to that time we had very good steamboating and usually had water. On a few occasions we had to haul freight from this point and to all points above here to the military points.

Mr. AUTEN. Can you tell us about freight rates?

Capt. EVANS. I am almost to that. I am not going to occupy over 10 minutes.

Col. BLACK. Go ahead, captain; you are very interesting.

Capt. EVANS. What I tell you is from observation and simple facts. I have retired from business, but I have an interest in the community in which I live. When they got this Fort Smith road finished there was competition. The boats still kept running. We had a line of boats from here up there. We hadn't discontinued them. The railroads discriminated against the river points and cut the rate down so some of the boats withdrew. And right there I want to say that Converse, who was president and represented the Fort Smith & Little Rock road, concluded he would put in a line of boats. He sent me up north to buy those boats for them. I wouldn't agree to take charge of those boats—he offered me a round price to do it—unless he would put on those boats "railroad line," so there would be no deception. I had been a steamboat man all my life and understood transportation. He wouldn't do it. So he failed to get the boats. In the meantime, there was a change in the superintendency of the road. Mr. Wood, who came in—the boats that hadn't been already thrown out by this discrimination were bought by Woods straight out, and they made two or three trips and laid up. He chartered me one of them, and I went down and did work on the Mississippi River for some time—contract work. That was what stopped the transportation on the Arkansas River at that time. The law wasn't as good then as it is now. They put the price down and bought these boats out. Occasionally a man would bring in one or two boats. That was 15 or 20 years ago. He would make one or two trips. They would take freight from river points at any price.

I saw a party in here this morning who was traffic manager of this line that carried six carloads of freight for 6¼ cents from the wharf to Russellville when they were charging 35 for the same class of freight. That's what stopped those people from running steamboats. That's one thing. And, of course, the river was getting shallower all the time and more difficult for want of improvements, and this discrimination that was allowed to run up to this time. The Interstate Commerce Commission didn't interfere with it. All these lines of boats were doing a thriving business when they came on the river. To-day there isn't less than 10, 20, 50 times the freight on the river. The railroads handle it, and it could be handled as well by steamboats. As far as prices are concerned, the river charges about 50 per cent of what the railroads do. Take it all the way around, it would be just about half. But this discrimination is going to stop. The State won't stand it I know. They will stop it if they haven't already done so. I haven't noticed in the last year or two. In fact, I haven't done anything in the last year or two except take care of myself and breathe mountain air up there. We want a river that we can handle boats on. We have got the same normal rainfall we had at that time, 65 years ago. Now, if we can get the same amount of water we had, boats can get in here at a great reduction from railroad prices and make a living and do well and accommodate people who are greatly inconvenienced now by the railroads, notwithstanding we have got some on both sides of the river within say 5 to 15 and 20 miles. I can state divers causes for this condition, but this one ought to settle it; they were taking freight at any price against the river. That was one thing. It wasn't altogether for want of water. Of course, a large business was done then. There is nothing moving to-day. You all know that. There is no use to make these statistical reports. It's all right to make them to show what we have got on hand to move. I don't think there has been a statistical report here this morning that I heard that is overdrawn at all, and, so far as some of them are concerned, they might be multiplied by 10. There is an immense tonnage that will come out of the Arkansas River when we get in a condition to move it.

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I have heard a great deal about Ozark. I want to tell you gentlemen you have got just as good water from here to the mouth of the Grand River as you have anywhere else. I know what I am talking about. In fact, the river would be so much more cheaply improved from Fort Smith to Muskogee, the mouth of the Grand River, than it would any other portion of the river. Even below Pine Bluff it couldn't be done as cheaply as it could up there.

I want to say another thing; it isn't going to be very popular and I may make some enemies by it, but I know from observation that there is no navigation above the mouth of the Grand River. The Grand River furnishes more water at a low stage of water than the Arkansas at all stages. There is the Verdigris and the Cimarron. The next greatest flow of water above there is Walnut Creek. When I went up on this special trip, when I was laying up all that winter on that sand bar for the Government, I had to go overland to get my money—to Arkansas City—to pay off every month. One trip I went up to Wichita. I want to tell you I couldn't see any water in the river. There were some holes. There were places you rode your horse across, and if you wanted to water your horse you could get down and dig a hole and get water. Sometimes, of course, in a flood there was water all right, but a great deal of the time there wasn't. There is no bed for the river if the water comes. When I came out that trip, in coming back to the mouth of the Grand River and coming back down home, some days I couldn't see land at all except little patches—towheads, islands. But it is possible, and feasible, to improve this river to the mouth of the Grand, and it can be done cheaply. There's any amount of material, but, of course, you engineers all know that. There's no use to speak about that.

Col. BLACK. We are much obliged to you, Captain.

Capt. EVANS. If there is any point that you want to ask any question about, there's nothing about the river from 1855 up to date but what I can answer.

Mr. AUTEN. The time is exceedingly short and we have two other river captains who have been on the river for many years, and while I dislike very much to ask them to limit their time in discussing this matter, on account of having so much data to present, I will necessarily have to ask them to be as brief as possible. Capt. H. C. Daniels.

Capt. H. C. DANIELS. Gentlemen, I have been steamboating on the Arkansas River since 1868 up to the present date. Now, relative to what we have had. I can say within my own experience we would have an average of three to four boats a week from here to Memphis making weekly trips. In my own experience I was o the steamer *Pat Cleburne*, that made 52 consecutive trips here in the year 1870 or 1871— I forget, now, which—between here and Memphis. At that time we had no railroads——

Col. BLACK. What did the *Cleburne* draw, Captain?

Capt. DANIELS. The *Cleburne* drew about 3½ feet light. With a full cargo she would draw about 5½ to 6 feet—not over 6 feet. The traffic at that time, on account of there being no railroad here, was practically everything that came into Little Rock.

Now, what we can do with a good permanent stage of water from here is a question that I could hardly answer conclusively, but I will say this, that we could do anyway—a boat line would do from 20 per cent to 25 per cent of the traffic in and out of this city. The traffic people can better say what it amounts to. We have from $1,500,000 to $2,000,000 a year here.

Col. BLACK. How much water would you want?

Capt. DANIELS. A stage of 4½ or 5 feet, with the character of boats that we could make now, that would be some improvement on the old-style boat. There are quite a number of improvements in the construction of steamboats now. I have had practical experience with the effects of what the present dredge boats have done in this river in the past 18 months, and my experience has been that they have done good work, and, wherever they have done work they have made a channel which, for the time being, was permanent. It has had good effect. I think that the maintenance of the present dredge boats, perhaps augmented by one or two additional ones, and proper snagging, will produce good navigation from Little Rock to the mouth of the river, at least.

You gentlemen have heard relative to the coal fields above here. There are but two permanent bars that are of a bad character between here and the coal fields, and I think there would be no trouble, say for six or eight months in the year, to have good navigable water between here and there.

Col. BLACK. What would be the depth?

Capt. DANIELS. That would be an average of about 5 feet, using barges that could be loaded to a depth of 4 feet.

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Col. BLACK. It wouldn't pay to use lighter-draft barges in that traffic?

Capt. DANIELS. No, sir; I wouldn't think it would. You could put on, perhaps, 12,000 bushels of coal to the barge.

Col. BLACK. We are very much obliged to you, Captain.

Mr. AUTEN. I want to introduce to the board Capt. Jeff Hicks, of Pine Bluff, also an old riverman.

Capt. JEFF HICKS. By profession, I am a steamboatman, an old pilot on the Mississippi River. The gentlemen just before me are more familiar with the Arkansas River than I am. I was a pilot on the Mississippi from St. Louis to Orleans in the old days—that is, in the latter part of the palmy days of the steamboat. I now have a little boat running north of Pine Bluff and one running south of Pine Bluff, I believe the only two boats running on the Arkansas River to-day, operating in the packet trade. Mine is a little towboat with barges; Capt. Myers's is a packet boat. I only go to a landing called Wildcat, about 35 miles north of Pine Bluff—run pretty regularly. Of course, at seasons of the year the river gets low, and, in building this boat, I undertook to build a boat to suit the river. It seemed to me it would be a pretty hard job to make the river suit the boats, so I undertook to operate on that plan. I am running pretty regularly, right along, and have been for the last two or three years, and expect to continue; but, from observation and my experience with the Arkansas River, from what I have seen of it in the last two or three years, the Arkansas River is a much different river from our other rivers—much more like the Missouri River—stiffer currents, shallower water, and such things as that.

During my days on the Mississippi, I ran out of Orleans on these larger boats, such as the *White* and the *Natchez* and the *Robert E. Lee.* Of course, that was the latter days. Those boats were very heavy craft—drew as much as 9 feet of water at the sternpost. I have seen as low as 9 feet at the mouth of Red River before the Government undertook to take care of the river and get better conditions—undertook to revet the banks—and the Mississippi is revetted for miles and miles. By that, it prevented the banks from caving in. When a bank caves in a river that causes a shoal. If it continues to cave at a bend, it keeps piling up and piling up. That's what brings so much shoal water. If the bank caves in, the timber caves in. That brings snags. The result is, you have got shallow places and your river is full of snags. I don't claim to say that the revetments protect the banks forever. They keep them from caving continuously, all the time, and from time to time the revetment is repaired. If a place caves in, of course, it's repaired. I don't know that there has been less than 18 feet at the mouth of Red River since the Government took charge. I have seen 6 feet at Natchez Island, where we have had trouble getting over with those large boats in the old days—the *Natchez* and the *Lee.* I understand from pilots nowadays that they never have less than 12 to 14 feet. That work keeps the banks from caving—this revetment work. It never caves. If you don't put anything in the river, you don't have to take it out, snags or anything else. In my experience on this river, what little short distance I run north of Pine Bluff, wherever I find a caving place above, the bank caves and settles below; that fills up and you have got a shoal place, maybe a foot and a half or 2 feet. My little boat runs on 20 inches. Of course, I built the boat to suit the river, because I had to go, and I have been going ever since I built her, and am going to continue to go. From what I can see about this river, or any other river, if you can just protect the bank from caving in, the timber won't cave in.

Col. BLACK. Do you know how much that revetment work costs?

Capt. HICKS. I suppose it costs a good deal.

Col. BLACK. Well, in Missouri the estimated cost is $50,000 a mile, where they have one solid bank that they don't have to protect. Here we would have to protect both banks.

Capt. HICKS. That isn't every place. If you stop one bank from caving, the current isn't so swift in the next bend; the water doesn't travel so fast. The river travels just like a billiard ball. It hits that rail and rolls out, and hits the other one and rolls back. Sand travels just as the water. The caves in this river are not as long as they are in the Missouri or Mississippi. I don't know of that bank north of Pine Bluff caving—in the 30 miles, I don't suppose there's three-quarters of a mile. In some places, of course. it caves worse, and much longer caves.

Col. BLACK. We are much obliged to you, captain.

Mr. AUTEN. I am just in receipt of a communication from The Lakes-to-the-Gulf Deep Waterway Association, which I am requested to present to the board. As the resolution is very short, I will take the time to read it and then will file it with the board.

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RESOLUTION OF THE EXECUTIVE BOARD OF THE LAKES-TO-THE-GULF DEEP WATERWAY ASSOCIATION.

"Whereas it has come to our attention that a recommendation has been made by an officer of the United States Department of Engineers that all work of improvement on the Arkansas River be abandoned on account of there being, in his opinion, insufficient commerce on the Arkasas River, present and prospective, and,

"Whereas the Arkansas River is one of the great arms or tributaries of the Mississippi River, and to pronounce the Arkansas River unworthy of improvement is taking from the great Mississippi itself a portion of the importance of its improvement, and thereby practically pronouncing against the improvement of all inland waterways, which pronunciamento we earnestly believe springs largely from an ignorance of those causes which contribute to the national commercial prosperity and is so necessary to the development of the great natural resources which abound undeveloped throughout the length of the great Arkansas River; now, therefore,

"*Be it resolved*, That we most earnestly protest against this proposed abandonment of this great stream, and that the great political and commercial inquiry as to the need or necessity of any contemplated improvement be left to Congress, whose determination may then be based upon knowledge of general conditions and upon evidence obtained from the communities to be affected by the improvements proposed.

"THE LAKES-TO-THE-GULF DEEP WATERWAY ASS'N,
"W. K. KAVANAUGH, *President*."

We have with us to-day a man who might be called an expert on the coal business of Arkansas. He was an expert miner when he came here many years ago. He has been connected with practically all the coal mines of Arkansas, and, while the time is limited, I am going to ask him to present a little paper he has prepared as to the quality and quantity of the coal in Arkansas, and also what might be done on the river if transportation is established. Mr. Hoye, kindly come forward.

Mr. JAMES P. HOYE. Gentlemen of the Board of Engineers: If I understand your mission down here, it isn't to determine whether the Arkansas River is feasible for navigation, but to find out whether or not there is sufficient tonnage to justify the expenditure by the Government, and, if there is sufficient tonnage, whether or not a large enough proportion of that tonnage would be shipped by the river.

I would respectfully ask your kind indulgence to listen to a few facts in connection with the coal industry of Arkansas. [Reads Exhibit M.]

Col. NEWCOMER. I understand that you were about to enter upon the shipment of coal upon the river as it now exists.

Mr. HOYE. We were getting ready. Mr. Patterson and I acquired an option on 500 acres of coal land——

Col. NEWCOMER. I mean this proposition of Mr. Mayo.

Mr. HOYE. It was after the Government had made this appropriation.

Col. NEWCOMER. That didn't contemplate any permanent improvement; that simply contemplated something like three and a half or four foot channel.

Mr. HOYE. Even so.

Col. NEWCOMER. You proposed to operate under those conditions?

Mr. HOYE. Yes, sir.

Mr. AUTEN. Now, gentlemen, we are nearing the end of this testimony. I wish to present to you for the next and last detailed statement Mr. Carl Baer, who is secretary of the Arkansas River Improvement Association and also secretary of the Chamber of Commerce of the City of Little Rock. In doing this I wish to state to the board that Mr. Baer has been sent over the rivers of the South probably more than 10,000 miles of travel and investigation for the Chamber of Commerce of Little Rock, to find out what there is in sight for the future of Little Rock, what improvements have been made in river transportation and in boats, and what river conditions are; so perhaps he speaks more advisedly than any other man in Little Rock on this subject.

Mr. CARL BAER. Gentlemen: After four years of work on this project I am glad to be able to meet this board and to submit to them my opinion of this important matter.

There are so many things of importance to bring before you, as you will see here on my desk the records and figures of river statistics compiled during the past four years. It would be useless to attempt to tell the contents of these papers in detail in the 30 or 40 minutes' time allotted to me. I am,

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however, going to ask the privilege of submitting to you later on the entire record (Exhibit N), and if in the future I can be of service to you in interpreting any of these figures or the data submitted, I shall be glad to render that assistance.

I am to-day, after hearing from Mr. Sengel, of Fort Smith, and those gentlemen from up the river, more than surprised at the volume of tonnage shown in their reports. I thought I knew something of the tonnage on the Arkansas River, and particularly as a timber man during the past 10 years in this State I thought I was pretty well posted on the merchantable timber accessible to the Arkansas River, but I find that the reports submitted far exceed in tonnage my ideas of the estimates.

I was a layman in so far as the bauxite and the stone tonnage is concerned, but these two items alone will, in my opinion, warrant the improvement of the river. The agricultural products which we are going to submit to you to-day available for shipment on the river are considerably more than we had anticipated.

The methods of transportation, the devices to be used on a shallow river, the engineering problems to solve to accomplish permanent navigation on shallow streams are too great for me to undertake a thorough discussion of at this time; but the first thing I desire to speak of is the freight-rate fabric which exists West of the Mississippi River. I would not be serving this public fairly after having represented the Little Rock Chamber of Commerce as its industrial commissioner and secretary during the past four years, and now acting secretary of the Arkansas River Improvement Association, unless I at this time impress upon your honorable body the geographical position of Little Rock and our Arkansas cities, and the gross discrimination against us on railroad freight rates. Gentlemen, I say this within the hearing of some of my good railroad friends, and I trust they will understand me fully, that I do not want to handle this proposition with gloves. It is too vital to the entire citizenship of this community not to give it earnest and careful consideration.

If you will draw a line along the south part of Missouri and follow it to the Pacific coast, then follow from the east Missouri line down the Mississippi River to New Orleans, the territory south and west of these lines lies in a district which, in my opinion, is vitally affected by the present high freight rates. Here in the State of Arkansas, a territory nearly 300 miles square, we find the vast resources of stone, coal, bauxite, timber, minerals, and cotton, besides the unlimited quantities of agricultural products—and increasing in quantity each year—the State is developing.

We must receive some recognition from the Interstate Commerce Commission on this freight-rate proposition, and if we could establish on the Arkansas River permanent navigation and place a transportation company permanently there as a common carrier, we would be in position to haul hundreds and thousands of tons, and that class of freight at a profit, at a materially lower rate than the railroads are hauling it for, which commodities are not profitable for railroads to carry. The situation, gentlemen, is practically paralyzing the industrial and agricultural development of this section.

I feel that I am representing 70,000 people in the city of Little Rock, and that these 70,000 people should know of this condition. You might answer me that the manufacturers and shippers are certainly in position to watch and correct such conditions. In reply to this, I see Mr. Dickinson in the audience. He represents a brick and stone industry, and is possibly aware of the freight rates on those commodities, but I venture the assertion that he is not familiar with the freight rates on thousands of commodities shipped into this city. Again, I see Mr. Heiman here, representing the largest department store in this city. He probably knows a great deal about freight rates on particular commodities shipped to his firm, but I feel certain that he is not aware of the gross discrimination against Little Rock on freight rates as compared to Memphis, Tenn. Therefore I am asking your honorable body to give most careful consideration to this rate situation and to the exhibits on freight rates which we are submitting to you to-day and which will become a part of the record in this case. One paragraph of a letter I have before me from Mr. A. R. Bragg, traffic manager of the Merchants' Freight Bureau in Little Rock, I would like to read to you. It is as follows: "You will note the rate from New York to St. Louis is 92½ cents per 100 pounds, about 985 miles, as against the rate of $1 per 100 pounds from St. Louis to Little Rock, a distance of 365 miles." You can see from this that there is something wrong somewhere, and it is not for me to say whether or not the Illinois Central, the B. & O., the Pennsylvania, the Wabash,

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or the Big Four Railroad are carrying this freight at 92½ cents at a loss or whether or not the Iron Mountain and Rock Island are making more money than they should in carrying the freight 365 miles at $1 per 100 pounds; but it is reasonable to assume that if the eastern railroads can operate on 92½ cents and haul commodities 985 miles, these roads in this State could haul the same commodities 365 miles at a much less rate than $1 per 100 pounds. The example submitted to you gentlemen is so striking and shows such unfairness that I am compelled to again state that it is vital in this case and must be corrected.

Again, if you will carefully analyze the exhibits on freight rates submitted by Mr. Taylor, the traffic commissioner of the Pine Bluff Traffic Association, you will see that we are paying, as Senator Clarke has said, from 30 per cent to 300 per cent in excess of other cities, particularly Memphis, Tenn. I will admit the 300 per cent differences apply only on some commodities shipped from Nashville, Tenn., to Memphis, as against the same commodities shipped from Nashville to Little Rock, but most of the commodities shown in the freight exhibit I am submitting to you, marked Exhibit N–1, show at least 100 per cent more for Little Rock than for Memphis, Tenn., on first-class commodities from St. Louis, Louisville, Cincinnati, Nashville, Pittsburgh, and Chicago. This in itself is sufficient reason for the stifling of the industrial and agricultural development of this commodity.

Mr. Hoye, who has had 20 years' experience in handling coal in Arkansas, and who for many years handled coal on the Kanawha, has told you in his report to-day that the coal can not move from the Arkansas Valley east and south unless the river is opened; that the freight rates are prohibitive and will not justify the movement. This is another great factor in this development. He further says that we have 800,000,000 tons available to the river, that this coal is of a superior quality, and that most of it lies where it can be easily handled from the mines to the barges. Certainly this is a most favorable condition for this great amount of tonnage.

Gentlemen, we could not have told you a few years ago that we had 10,000,000 tons of bauxite at our doors. We could not have told you that nearly 1,000 tons of this bauxite is being shipped daily to East St. Louis, Ill. We could not have told you that this same bauxite is the means of supplying 60 per cent of the world's consumption of aluminum, but if Little Rock is so fortunate as to be located within from 3 to 16 miles of the natural bauxite fields of the Western Hemisphere, and if there is enough bauxite here to last half the world a lifetime, then we have the right to ask the United States Government to participate in the expense of making ready for navigation a stream of water to carry that ore to the markets of the world. Mr. Fox, of the Aluminum Co. of America, has testified to-day that they are moving 240,000 tons of ore per annum from Arkansas to East St. Louis at a cost of $2.20 per ton. He says further that he believes it possible to move this bauxite by water at a cost of $1. I do not care to argue this particular part of the case, but I will state to you that if the Aluminum Co. of America can move this tonnage at $1.50 from Little Rock to East St. Louis, it will mean a saving of $500 or $600 a day to that company, and place that company in a far better position to compete with France, England, and Germany in the sale of aluminum throughout the world; and, after all, should we not seek to place our home manufacturers and producers on a substantial footing, enabling them to compete with all foreign countries? Should we not prepare to move 1,000 tons of this ore from this port to East St. Louis and take advantage of this great movement of freight to produce more tonnage for the Mississippi River on which the Government is spending money annually for improvement? I say to you, gentlemen, that I think the promise of the movement of this bauxite is to-day a substantial asset which the Government must take cognizance of, and if the Iron Mountain or Rock Island can not carry this ore for these people at the rate at which they can carry it on water, we are certainly not inflicting a hardship upon these roads in moving it at a price which would lose them money to move it. You might answer me in reply to this statement that I am trying to shift this burden financially upon the Government, and asking you to appropriate $10,000,000 to fix the river. My only reply would be that the aluminum is but a small part of the tonnage we have to move, and that once the channel is opened the Government will reap indirectly a profit far greater than the amount of money expended to improve the river.

Independent of the tonnage we expect from the Aluminum Co. of America about 30 of the merchants and shippers at Little Rock, Ark., offer now to be moved by river at least 5 times as much tonnage for the river as is now moved on the Missouri River by the Kansas City (Mo.) Navigation Co.

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The city of Little Rock is about 100 years old. It has grown to a population of about 40,000 white people. If the freight-rate situation to this section of the country has materially interfered with the growth of the country, are we not entitled to receive substantial aid for the improvement of such a great by-way to commerce as the Arkansas River? We believe that the railroads will profit handsomely by this development, and the country along the lines of the railroad will materially increase the volume of their business and make up for any losses sustained in the lowering of the railroad rates. I am sure that if Little Rock could grow industrially to become a city of 150,000 people in the next 10 years, the Iron Mountain, the Rock Island, and the Cotton Belt roads would make more money on the increased volume of business at a lower rate than at the higher rate of to-day on the limited business they are doing in Little Rock.

I desire again to state that this particular territory is the most productive field for tonnage to move by river of any territory of the same size in the United States. I lived for 34 years on the Ohio River. I attended the first meeting over 20 years ago of the Ohio River Improvement Association; I have seen all of the development upon that river with its locks and dams, and though that river is not utilized as it should be in carrying freight upstream, I think this can be attributed to the small volume of river business on all of the inland rivers, and we can not hope to move freight upon these different rivers until each river project develops sufficient tonnage to make the interchanging of freight to the different river lines profitable. This will be one of the links necessary to strengthen the chain.

If the Federal Government is paying to improve the Mississippi River and is to spend, say $50,000,000 on the project, it seems to me of vital importance in considering that expenditure to know how much tonnage can be produced from the tributaries of the Mississippi and what expenditure must be made to produce that tonnage. In this connection I desire to state that from the showing made to this board to-day the Arkansas River will produce as much as any of the tributaries to the Mississippi and should receive its proportionate share of Federal appropriations.

Mr. Fox and Mr. Finney, of the Aluminum Co. of America, have stated to you that their company has invested $1,500,000 in a terminal at St. Louis; that possibly $1,000,000 of this is in the terminal railroad that surrounds the city and $500,000 in a line running to the river, including dock and river facilities for receiving freight; that this company has in mind the shipment of bauxite on the river; and that all of their plants in the United States are supplied from the raw material bauxite at or near Little Rock, Ark. Gentlemen, this is new tonnage. I say new tonnage because no engineering board which has yet been called upon to pass upon this project has ever had this tonnage submitted to it for consideration. The last time a recommendation was made to Congress by an engineering board, none of us knew how much bauxite there was near Little Rock. We didn't know the value of this material, and when we bring before you these gentlemen representing their great aluminum industry and you are told that they have come before you for business and to outline to you their plans for the future, we can not lay too much stress upon the importance of this volume of tonnage ready to be moved when the Government has done its part. Mr. Fox told you that they were moving annually 240,000 tons to East St. Louis, and that there is every reason to believe that this amount will be increased from year to year. He further states that he has every reason to believe that, at the present rate of consumption and shipment, there is sufficient bauxite in this particular district in Arkansas to last a lifetime, and that he believed that his grandchildren would not live long enough to see the bauxite of Arkansas all utilized. This company made an experiment last year, and moved by water via the White River and the Mississippi about 15,000 tons to East St. Louis. They accomplished it with wooden barges and the old-style towboats, and they moved it, including the rail-rate haul from their lines to Devall Bluff on the White River, at a less cost than the present railroad rate, the rail rate on that haul to Devall Bluff being 70 cents per ton. They had only temporary equipment for the loading into barges at Devall Bluff, and the river haul was made under contract with a towboat company, and it is presumed they made a profit. If the Arkansas River were made navigable, in all probability this company would build its own short line of railroad from the mines to Little Rock, unless a satisfactory rate could be secured from the railroads now running to the mines. I make this statement in order to show you gentlemen another reason for opening up

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a permanent channel to the city of Little Rock, which is the nearest point on the Arkansas River to the bauxite mines of Arkansas.

Now, the question of the kind of boats to utilize on this river. I have consumed now 18 minutes of my time, and before closing I am going to ask the board to consider something on the boat situation. [Places blue print before board.] The question has been asked by members of this board several times, "Why have the boats gone out of business? Why, when the railroads came and placed a freight rate upon the commodities moved upon the river, why didn't the boats continue to do business?" In connection with this, I desire to call your attention to a few figures and facts. The old steamboat *Jim Lee*, now at Memphis, and running on the Mississippi River, is one of the most modern side-wheel steamers in use in the valley. She was built about 15 years ago. These side-wheels, two in number, are over 30 feet in diameter and 20 feet long, made of 4-inch oak timber and steel, and, with the shafting and equipment necessary to propel these wheels, she is carrying in the aggregate 80 tons of wheels and equipment. Figuring freight at a minimum of $2 per ton, I claim that this steamer is losing $100 per trip in being compelled to carry this extra burden for the lack of modern equipment and devices. There has been but little improvement in the past half century in shallow-river boats. The same old slide-valve engines, the same old equipment in paddle wheels, the same heavy constructions, and the unnecessary decks and cabins, make it almost impossible to operate boat lines in competition with railroads equipped with every modern appliance. The handling of freight off and on these boats by the old-time deck hand, and the lack of modern terminals and equipment to exchange this freight from boat to rail and from rail to boat, these conditions are the reasons for the old boat lines going out of business, and, in many cases, on many rivers, we find where railroad lines have placed boats upon the river for ruinous competition.

Mr. John H. Bernhard, a marine engineer of New York; Mr. R. C. Wilson, a marine engineer of New Orleans; and the engineering department of the Kansas City Navigation Co. have been for years working hard on this inland navigation project and striving to equip boats for the purpose. The citizens of Kansas City have expended over a million and a quarter of dollars in experiment. For many years it has been thought impossible to navigate shallow rivers with propeller wheels, on account of the wheels being placed so deep in the water and coming in contact with snags and sand bars, and not until the tunnel-type boat was invented was there much hope of using the propeller wheel in extremely low water. The open-type propeller, such as used on the Bernhard barges, are most practical in rivers such as the Mississippi, where, most of the year, there is from 7 to 10 feet in the channel; but on the shallower streams, like the Missouri and Arkansas, up to the present date the tunnel-type boat has been found most efficient. I will admit that there are still many modifications and improvements to be made in the self-propelled barge, and these changes will only come as time goes on and as mechanical agencies are brought into the field for inland navigation. The propeller-wheel tunnel-type boat has not until recent years ever been considered by the Government in solving the problems of inland navigation, but, in my opinion, it is now a most important factor and should be taken into consideration in deciding upon a definite plan for river improvement. The engineers now working on the problem are striving to bring the boats higher in the water and attempting to secure the best efficiency from the propulsion of the wheel. It is safe to figure that the tunnel-type boat with a 48 or 50 inch wheel can operate successfully in 20 to 24 inches less water than the open-type propeller. There is still a question as to the number of wheels to be utilized.

It is still a debatable question as to whether more efficiency can be obtained by fewer wheels of large diameter than by a greater number of wheels of less diameter; but these problems will be eventually solved. If you are not familiar with the tunnel-type boat, I would like to state, at the stern of the boat a steel tunnel is built, which tunnel covers the wheel and when the boat is stationary approximately 40 per cent of the wheel is out of water. When the wheel is in motion, the centrifugal force of the wheel gathers the water from in front through the tunnel and displaces it at the back end of the boat in a stream approximately the same size as the diameter of the wheel. The discharge of this volume of water from the rear of the boat propels the boat forward.

Mr. Wilson, a marine engineer of New Orleans, made the following test: That a stern paddle boat with its wheel running at 30 revolutions per minute, with a fixed head of steam, running in 18 feet of water, would slow down to 15

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revolutions per minute with the same steam head and all conditions remaining the same, when the boat was operating in 7 feet of water. The speed of the boat was approximately reduced from 7 miles to 3½ miles per hour, and the same quantity of coal used, showing conclusively that to operate the old paddle wheel in shallow water greatly increases the fuel cost of operation. I dare say that all of the steamboat men in this room know too well what I mean by "the shake of the boat" when you are approaching shallow water, but I am safe in saying that none of them ever figured the actual cost of operating the boat in shallow water as compared to the deep water. Nearly all steamships in the world are moved by the propeller wheel, and it is fair to assume that if we can apply propeller wheel propulsion to shallow river navigation we have made a great step in the advancement of operating boats on shallow streams. Freight boats on inland rivers handling freight in carload lots should not attempt to carry passengers at a profit, and if the modern shallow river craft will operate in the freight business alone, and do away with that excess weight in its cabin construction, substituting that cabin and deck space in weight with tonnage that brings an income, a very great part of this difficult problem will be solved.

I would not presume to outline a plan for the improvement of this river, or to criticise the Government for placing these two dredge boats on this river for the dredging of the channel. That is not my mission here, but I understand these boats have been operating only a few months in the year, at a great loss to the Federal Government compared to the results accomplished. If they are not the proper equipment, they ought to be removed and supplanted with something that is economical as well as practical, but I still believe these boats can be utilized in effecting a permanent channel where revetment of banks and permanent channel work has been completed. If smaller dredging devices can be utilized on short crossings which could cut quickly a narrow channel through these crossings, it would enable the large boats to be used in more permanent work and be the means of covering more territory at a less cost. In my opinion, with the modern mechanical devices for navigating these shallow streams, the engineering problems to be solved by your honorable body are not so difficult as they have been in the past when only the old type of steamboat was used.

You will see on the Ocmulgee River a boat drawing 6 inches at the bow and 22 inches at the stern light, when, loaded with 300 bales of cotton, it operates on about 30 inches of water. The fuel cost of operating this boat is 36 cents per hour, manned by 5 men on the day run and 4 on the night run, a total of 9 men in operating the boat 24 hours.

Another difficulty which confronts the steamboat captain, particularly on the Arkansas River, with its acute bends, is the steering of the boat around these bends and keeping the boat from the bank. With the paddle wheel, you will appreciate that the boat must have sufficient momentum in coming upstream for the steering device or rudder to be effective, and when a boat in a swift stream moves slowly, the rudder effect is practically nothing, and the boat, consequently, by the swiftness of the stream, is thrown into the bank. This does not occur in operating with the propeller-wheel boats, as all modern propeller-wheel boats are equipped with twin or triple screws. One wheel operating forward and the other reversed will control instantly the direction of the boat. Another factor of importance in crooked rivers: The engineers in charge of the Kansas City Navigation Co. have prepared to make a series of important tests on the Mississippi River with a tunnel-type boat now owned by the Government. These tests will be made in order to ascertain the number of revolutions per minute necessary to produce the greatest efficiency for the propeller wheel and other important mechanical tests.

We are planning now to build a modern steel barge-with water-tight bulkheads, equipped with modern engines and wheels, and to make a thorough test of this craft on the Arkansas River, following, as near as possible, the plans and devices used by the Kansas City Missouri Navigation Co., as we believe the conditions on the Missouri River and Arkansas are similar. These self-propelled barges, as we call them, are also used as towboats. If more publicity were given to the many problems confronting us on inland navigation, showing the necessity for modern mechanical-boat equipment and gas, gasoline, oil, or steam engines, I believe such men as Mr. Ford, of the automobile company, would render the movement valuable assistance through his engineering department, as the automobile people of America have been able to solve many of our most difficult problems in mechanical engineering. The two things we have to consider are shallow craft and propulsion, but up to the present date there are but few men in America working on these problems, and I take this

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opportunity to congratulate the citizens of Kansas City on the great work they are doing along these lines, spending their own money to solve problems for all of the inland rivers, and the time has come when the Federal Government must encourage such work as these men are doing in Kansas City. In my opinion, it is going to rejuvenate inland navigation on the waters of this country. The United States, with the Panama Canal just finished, is practically walking on one leg, the other leg being the Mississippi River and its tributaries, and unless we are willing to improve these rivers to complete the water route from the Lakes down the Mississippi and to the canal, we are going to greatly impair the progress of these Central States.

Mr. Roosevelt advocated completing the Mississippi River with the depth of a 15-foot channel. This would cost hundreds of millions of dollars. I claim to-day that, with the present channel in the Mississippi, a moderate expenditure on improvement, utilizing the modern craft for navigation, and the building of terminals and equipment for the economic handling of freight, will accomplish the results and be the means of completing the water route from the Lakes to the Gulf and through to the Canal, and that the United States will then stand upon two legs instead of one. I again say let us not in this country spend millions of dollars on the Mississippi River unless we expect to navigate its tributaries.

I am taking up too much of your time, but the crying need of these 70,000 people whom I represent is development. I am making no apology to the railroads, for I firmly believe that the opening up of this great river will be of material assistance to them. And before closing let me state again that as we we are supplying one-half of the world with aluminum from near this river, with the coal field of 800,000,000 tons lying along the river, with 120,000 tons of stone used by the Federal Government last year on the Mississippi River below the mouth of the Arkansas, with the quarries in operation on the banks of the Arkansas at Little Rock, and an unlimited supply of stone at hand, with the timber resources that you have before you, I believe our case before your honorable body has been well established.

I desire again to offer my services at any time to this board in assisting to interpret or to analyze the figures submitted in this record, as in my opinion no more important matter has ever come before your honorable body than the permanent improvement of the Arkansas River.

Mr. AUTEN. I am going to ask leave to file a short brief [Exhibit O].

Col. BLACK. Can't you give us an abstract of it?

Mr. AUTEN. In some respects it has been largely covered by what has been given in figures. In the first place, I believe the question of the amount of commerce not only available if transportation is restored on the river has been established here, but the fact has been established that that transportation is available now whenever that river is improved. The question has been asked "Why don't you put it on the river several months in the year if that is true?" It so happens that we are in a position to answer that question. I have been president of the Little Rock Packet Co. for a number of years. We put two boats on the river. We have the two boats now. The river did not permit of its being navigated. Here is our experience: I would go to the jobbers and say, "Here are two boats. Will you give us business"? "Yes; we will have it in 90 days at Memphis. Can you haul it?" I would say, "I don't know. We can't say. Perhaps next week will see a sand bar in the way." They say, "Then you can't haul it." I am here to say to you gentlemen that improvement must come first. Our boats were tied up some time ago at a high stage of the river with dredge boats almost in sight of them, and that thing may occur week after week, and we can't get contracts from shippers unless we can deliver the goods, if you will permit me that slang expression. They couldn't trust their freight to us, therefore we went out of business. They said, "Whenever you can tell us you can haul the freight we will give you the contracts, but we can't trust you with it until we know you can do it."

It has been our intention to touch only the commercial side of this question. The engineering of it is up to you gentlemen. You are a board of experts. The United States Government has placed you in this position because you are experts. Your long experience enables you to say with definiteness the things that we could only guess at. We do believe, however, that American ingenuity is as great as any other ingenuity. I have traveled Europe over time after time and have seen them running boats on little streams not nearly as big as we have here. I don't know whether it's dikes or jetties, but I am persuaded and

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do believe that American ingenuity will enable you to say where it shall be revetted and at what point it will be dredged. I think this board will be able to say when and how this work shall be done. Another thing I am not in favor of and I am persuaded you are not in favor of, and that is any hand-to-mouth methods. We don't want to waste the Government's money. We don't want to put anything in to-day and have it swept away to-morrow. We believe a system should be adopted for improving the channel of this river which, when carried out, will reduce the cost to the least possible minimum of expense. That is our contention. That is our idea. We are not asking you gentlemen to throw away any money, but we have here a proposition that is so vast, that is of such importance to the Southwest that we are intensely in earnest, and we are glad you have come here, and you have been exceedingly patient in listening to this. Of course, we have put in much extraneous matter, because we didn't know how to get in some things without putting in others. We are coming to you and asking you to help solve this question. It is a serious question to us, and it is going to be a serious question for generations to come unless this board gets down to a survey and makes a plan by which appropriations may be made over a term of years which shall improve this channel and give us the transportation for this low class of freight which we are so richly endowed with and which the railroads can not afford to handle for us on account of the cheap rates. I don't know, gentlemen, as it makes so much difference—let me say that accurately—I don't know as it makes so much difference what the cost of this improvement is. The United States Government has demonstrated the fact that it isn't so very careful if it gets returns for its money. In other words, a million-dollar investment that brings back a good return is a good thing, but a fifty-million-dollar investment is just as good if it brings back adequate returns. Our country in the last Congress voted—I forget how much—$35,000,000 to build a little railroad up in Alaska that is frozen up a part of the year, that has got a few scattered Indian villages but practically no commerce to-day.

That demonstrates the fact that the United States Government is not looking for present commerce, but they are looking into the fields that may develop in the interest of this great Nation. We have resources in this valley as great as they will ever produce in Alaska, and I am here to say to you gentlemen that this is a business proposition; that if it costs $25,000,000 to work out this channel, which can be maintained at a small cost, it will be a better investment. My friend, Senator Robinson here, voted for that Alaskan appropriation, and I believe it is a good thing. Our Government is growing greater and larger every year, and $10,000,000 or $25,000,000—whatever it may be—if we are getting a good bargain for the Government, we shouldn't hesitate about that. The question is, shall we get honest work? The question for you gentlemen to work out is, how shall it be done? We ask you in the name of four millions of people settled in these two States, who have been struggling for two generations to develop these States, we ask you in the name of the children who have been living wretchedly poor and whose children will live wretchedly poor unless they get this, we ask you to work it out for us so that there may be opened up to us a proper outlet for our resources.

I want to thank you gentlemen for your patience. We want to thank you for coming to Arkansas. You heard of Arkansas before you came. Our friend, Opie Read, wrote about it. I came to this State from Michigan. The men of Arkansas came from almost everywhere. Our children are born and reared here. Arkansas is a serious proposition, and no joke. Oklahoma is a serious proposition.

Senator Robinson is with us. We still have 15 or 20 minutes. I want to ask the Senator to say a word to us. I thank you again.

Senator JOE T. ROBINSON. Mr. Chairman and Gentlemen of the Board of Engineers: I should have been very glad indeed to have submitted this case without any statement upon my own part for two reasons: First, the case has been fully discussed, and detailed statements have been made by gentlemen who are familiar with the facts and circumstances surrounding it; and, second, I desire that you shall have an opportunity of meeting other engagements which I know are imperative upon you. For that reason, the last reason, I am going to make my remarks very brief.

It seems to me that this subject, boiled down, involves two big questions. One of them is a peculiarly technical question in some of its aspects; and, as has been stated by Mr. Auten, laymen—persons who are not professional engineers—are perhaps not highly qualified to speak on that question. These two questions

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are, first, is the improvement of the Arkansas River for navigation purposes feasible; and, second, will it be availed of for commercial purposes to a considerable extent?

Now, the first question has new light reflected upon it by reason of the fact that new means or devices in the way of improved boats are being constructed and used which do not require the depth of channel which the large boats formerly used did require, and I apprehend that for present purposes a channel in the Arkansas River of the depth of 4 feet would in all probability be adequate to carry the commerce that would be tendered for some time; and, in determining this question, this board of expert engineers, I think, will take into consideration that fact along with the further fact that gentlemen of equal eminence and patriotism have heretofore considered the subject, and even under the great difficulties that confronted them then they have found that the improvement of the Arkansas River for navigation purposes is feasible.

As to the amount of money that would be required to be expended before this project is to be completed, I do not think that even the profoundest expert or the most skillful one could tell that with absolute accuracy, but suffice it to say, that I know that the Federal Congress is not going to appropriate at any one time $5,000,000, $10,000,000, of $20,000,000 for a project of this character without a definite program of improvement extending over a term of years.

Upon the second proposition I maintain that in a trial in any court where the burden is upon the plaintiff to establish by a preponderance of the evidence the contention of his complaint that those who are interested in this hearing have established by a fair preponderance of the evidence, and almost conclusively, indeed, the fact that if this river is available for navigation purposes an enormous amount of commerce will be carried on upon it. This city of Little Rock, through its business men, who are in a sense responsible, has pledged approximately 500,000 tons per annum, and two other cities, Pine Bluff and Dardanelle alone, and the localities surrounding them would raise that to 750,000 tons per annum; and that is not taking into consideration the enormous quantity which would come from other communities of the so-called low-grade freights and products.

The people of the State of Arkansas, under the circumstances that have existed for many years and as they still exist, believe that the improvement of the Arkansas River is necessary to the proper growth and development of their industries and to the development of the enormous resources of which the world knows so little, but which the most ignorant can not remain totally unconscious of if he visits the State. Handicapped as this State has been during the past for want of adequate transportation facilities, we have not developed as rapidly as we should have developed—nothing like as rapidly as the State is capable of progressing, and if this improvement is made, not only the State of Arkansas but the sister State of Oklahoma and other adjoining communities will come forward, we believe, and the wisdom of the investment on the part of the Federal Government will be amply and fully demonstrated.

Now, gentlemen, I could go into a somewhat more detailed discussion of this matter, and if I had the time to do so I might undertake it, but you are trained in the study of these things. The weight of the evidence I say—and this evidence is just as conclusive as it can be without bringing the actual contracts for the freight and laying them at your feet—the weight of the evidence shows conclusively that if the river is opened to navigation it will be used for the transportation of an enormous amount of freight, perhaps more than 1,000,000 tons per annum, and that is sufficient, in my judgment, to justify the expenditure upon the part of the Federal Government that will be required to carry forward this improvement.

I hope and I know that this case is not in the attitude of one that went to the old judge up in Missouri a few years ago, an old justice of the peace, who said he would take the case under advisement until the next Saturday morning at 10 o'clock, when he would promptly decide against the plaintiff.

I feel that there are interests involved in this hearing that mean a great deal for the progress and prosperity and the happiness of the people of this State. We feel that we are not only an integral part of this great Union but that we are entitled to equal advantages and opportunities for advancement with other States of this Union, and we feel that if the Arkansas River, with the commerce that lies about it and is available for transportation upon it, were in other sections of this Union there would be little question about its future and rapid improvement; and we hope, gentlemen, that when you have considered this

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case you will find it consistent with the discharge of your duties to continue this improvement upon a substantial basis. I thank you.

Mr. AUTEN. I believe that concludes our hearing, gentlemen.

Col. BLACK. If you have anything more to present we want you to present it.

Mr. AUTEN. Nothing, I think. It is now six minutes until 4 o'clock.

Col. BLACK. We will be glad to receive any further communications.

Mr. BAER. A lot of new matter has come in to-day that I haven't in a form to submit at this time.

Col. BLACK. How long would you want?

Mr. BAER. Say 15 days.

Col. BLACK. That will be granted. If there is no further evidence before us the meeting is now adjourned.

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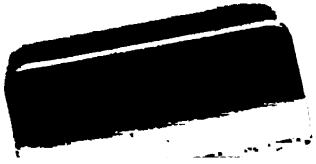

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